This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

KEY

TO

WILLETT'

MENTAL AND PRACTICAL

ARITHMETIC;

SOLELY DESIGNED

FOR THE

USE OF TEACHERS.

POUGHKEEPSIE:
PRINTED AND PUBLISHED BY WILLIAM WILSON
NEW YORK:—ROBINSON, PRATT, & CO.
1846.

Educ T 118.41.879

SIGILL : COLL : HARVARD : CANTAB : NOV : ANGL : 1650.
CHRISTO ET ECCLESIAE

The Gift of
John Joseph May,
of
Dorchester,
19 March, 1864.

B. S. Hanlon

3 2044 096 993 852

KEY

TO

WILLETT'S

MENTAL AND PRACTICAL ARITHMETIC;

SOLELY DESIGNED

FOR THE

USE OF TEACHERS.

POUGHKEEPSIE:
PRINTED AND PUBLISHED BY WILLIAM WILSON
NEW YORK:—ROBINSON, PRATT, & CO.

1841.

Educ.T. 118.41.879

1864, Mar. 19.
Gift of
John Joseph May, Esq.,
of Dorchester.

Entered according to Act of Congress, in the year 1841,
By WILLIAM WILSON,
in the Clerk's Office of the District Court of the Southern District
of New York.

PREFACE

In presenting to his brethren the teachers of the United States the key to his New Arithmetic, the author disclaims all intention of arrogating to himself any merit of *originality* or *pre-eminence* of design so frequently assumed by school-book-makers.

In the following pages he offers a plain and concise Key to a very plain and unpretending work, leaving to his fellow-teachers the task of deciding on its claims to excellence of plan and execution.

The corresponding page in the Arithmetic is given at the top of each page of the Key and the figures over each example point out the number of the example in the Key.

POUGHKEEPSIE, *7th Month*, 1841.

A
KEY
TO
WILLETT'S ARITHMETIC.

NUMERATION. (Arith. 20.)

Write the following numbers in figures.

(2)	20	(8)	909	(14)	30003
(3)	56	(9)	5408	(15)	1473689
(4)	100	(10)	26824	(16)	15000502
(5)	106	(11)	545490	(17)	73000010
(6)	283	(12)	908000	(18)	932340817
(7)	746	(13)	600000	(19)	200006003

SIMPLE ADDITION. (Arith. 22.)

(11)	1255	(17)	15633	(22)	15851
(12)	1579	(18)	21110	(23)	17503
(13)	1952	(19)	26263	(24)	46708
(14)	17504	(20)	26199	(25)	64141
(15)	13119	(21)	11895	(26)	99093517
(16)	25486				

PROMISCUOUS EXAMPLES. (Arith. 22.)

(27)	9252	(30)	347	(31)	300
(28)	89355		7400		16000
(29)	862711		311000		100000
			98001		15000000
			1000403		6328
			8100		15122628
			52000000		
			53425251		

SIMPLE SUBTRACTION. (Arith. 23.)

(5)	16	(10)	39081	(14)	30181995
(6)	32	(11)	5424810	(15)	8835828
(7)	561	(12)	239572	(16)	36914008
(8)	329	(13)	2873359	(17)	1195862
(9)	291				

PROMISCUOUS EXAMPLES. (Arith. 24.)

(18)	(19)	(20)	(21)
540313	108632145	325	60000
7953	341	156	15604
532360	108631804	169	44396

(22)	(23)	(24)
1000000	1000000	987000000
999000	1	987000
1000	999999	986013000

SIMPLE MULTIPLICATION. (Arith. 26.)

(4)	40682464286	(7)	21608	(10)	300546112
(5)	5348	(8)	114173068	(11)	320662895
(6)	11613	(9)	171259602	(12)	499045608

(13) 289656234 (15) 726624126 (17) 518547161
(14) 593095856 (16) 97614360 (18) 3280873824

CASE II. (Arith. 27.)

(21)
15292
22938
244672

(22)
53788
46104
514828

(23)
26155
20924
5231
758495

(24)
173944
260916
261089944

(25)
2637635
4220216
1055054
150345195

(26)
2422629
538362
1615086
1076724
1246038849

(27)
126015
50406
100812
101442075

(28)
2095888
785958
1571916
1833902
2001049068

(29)
1900460
2660644
3040736
3069242900

(30)
4220280
1055070
3692745
2637675
527535
8297070480

(31)
190078660
228094392
266110124
152062928
1523290628842258 0

CASE III. (Arith. 28.)

(32)
21200
70
1484000

(33)
61472
53788
59935200000

(34)
143704
107778
109215040000

(35)
360000
120000
43200000000

(36)
3748215
6746787
4497858
5210018850000

CASE IV. (Arith. 28.)

(38)
764131
6 times 8 are 48
4584786
8
36678288

(39)
342516
7 times 8 are 56
2397612
8
19180896

(40)
91738
9 times 9 are 81
825642
9
7430778

(41)
4976
9 times 12 are 108
44784
12
537408

(42)
3742
12 times 12 are 144
44904
12
538848

SHORT DIVISION. (Arith. 29.)

(3) 432413241 (8) 12471826 (13) $3730572\frac{2}{11}$
(4) $36255382\frac{1}{2}$ (9) 13061526 (14) $5365104\frac{1}{11}$
(5) $2403490\frac{2}{3}$ (10) $4727026\frac{3}{8}$ (15) 8490975[illegible]
(6) $15526033\frac{1}{4}$ (11) $8111653\frac{4}{9}$ (16) 9178285[illegible]
(7) 19407224 (12) $439017\frac{2}{10}$

LONG DIVISION. (Arith. 31.)

```
           (18)
21)742859326(35374253
   63
   --
   112
   105
   ---
     78
     63
     --
     155
     147
     ---
       89
       84
       --
        53
        42
        --
        112
        105
        ---
          76
          63
          --
          13 Rem.
```

```
           (19)
21)540637045(25744621
   42
   --
   120
   105
   ---
    156
    147
    ---
      93
      84
      --
       97
       84
       --
       130
       126
       ---
         44
         42
         --
          25
          21
          --
           4 Rem.
```

```
         (22)
422)253622(601
    2532
    ----
       422
       422
       ---
```

```
      (23)
41)4633(113
   41
   --
    53
    41
    --
    123
    123
    ---
   (20)
31)742859326(23963204
   62
   ---
   122
    93
   ---
    298
    279
    ---
     195
     186
     ---
      99
      93
      --
       63
       62
       ---
       126
       124
       ---
         2 Rem.
```

```
   (21)
31)520637045(16794743
   31
   ---
   210
   186
   ---
    246
    217
    ---
     293
     279
     ---
      147
      124
      ---
       230
       217
       ---
        134
        124
        ---
         105
          93
         ---
          12
```

```
   (24)
72)92587(1285
   72
   ---
   205
   144
   ---
    618
    576
    ---
     427
     360
     ---
      67
```

```
   (25)
75)40231(536
   375
   ---
    273
    225
    ---
     481
     450
     ---
      31
```

(26)

```
72)137896254(1915225
   72
   --
   658
   648
   ---
    109
     72
    ---
     376
     360
     ---
      162
      144
      ---
       185
       144
       ---
        414
        360
        ---
         54
```

(27)

```
252)46242(183
    252
    ---
    2104
    2016
    ----
     882
     756
     ---
     126
```

(28)

```
342)13699840(40058
    1368
    ----
      1984
      1710
      ----
       2740
       2736
       ----
          4
```

(29)

```
736)863256(1172
    736
    ---
    1272
     736
    ----
     5365
     5152
     ----
      2136
      1472
      ----
       664
```

(30)

```
2076)1893312(912
     18684
     -----
      2491
      2076
      ----
       4152
       4152
```

(31)

```
1234)46447786(37640
     3702
     ----
      9427
      8638
      ----
       7897
       7404
       ----
        4938
        4936
        ----
          26
```

(32)
3467)4586841(1323
3467
11198
10401
7974
6934
10401
10401

(33)
8465)761858465(90001
76185
8465
8465

(34)
90001)761858465(8465
720008
418504
360004
585006
540006
450005
450005

(35)
38473)119184693(3097
115419
376569
346257
303123
269311
33812

CASE II. (Arith. 31.)

(37)
32]0)7617[3(238
64
121
96
257
256
13

(38)
65]00)37943[26(583
325
544
520
243
195
4826

(39)
49]000)421407[256(8600
392
294
294
07256

(40)
214]00)46736[25(218
428
393
214
1796
1712
8425

(41)
1]00)76495[80
76495

(43)
1]000)763[753
763

(42)
901]000)654347[230(726
6307
2364
1802
5627
5406
221230

Case III. (Arith. 32.)

(45)
6 times 8 are 48
6)20208
8)3368
421

(46)
4 times 6 are 24
4)467412
6)116853
19475 3
multiply by 4
12

(47)
6 times 9 are 54
6)937387
9)156231 1
17359

(48)
9 times 12 are 108
9)145266
12)16140 6
1345

49
12 times 12 are 144
12)1575360
12)131280
10940

SUPPLEMENT TO MULTIPLICATION AND DIVISION.
(Arith. 33.)

(3)
2)16
$6\frac{1}{2}$
8
96
104

(4)
2)215
$3\frac{1}{2}$
$107\frac{1}{2}$
645
$752\frac{1}{2}$

(5)
8
$4\frac{3}{4}$
4)24
6
32
38

(6)
5)126
$8\frac{1}{5}$
$25\frac{1}{5}$
1008
$1033\frac{1}{5}$

(7)
57
$24\frac{2}{5}$
5)114
$22\frac{4}{5}$
228
114
$1390\frac{4}{5}$

(8)
36
3
4)108
27

(9)
126
$143\frac{6}{7}$
7)756
108
378
504
126
18126

(10)
148
$24\frac{4}{5}$
5)592
$118\frac{2}{5}$
592
296
$3670\frac{2}{5}$

(11)
3)29
$7\frac{1}{3}$
$9\frac{2}{3}$
203
$212\frac{2}{3}$

(12)
47
$31\frac{3}{8}$
8)141
$17\frac{5}{8}$
47
141
$1474\frac{5}{8}$

QUESTIONS TO EXERCISE ADDITION. (Arith. 33.)

(1)	(2)	(3)	(4)	(5)	(6)
85	437	302	68	7354	275
74	216	58	37	1200	320
27	105	29	25	158	75
	541	34	54	235	
		16	12	500	
			8		
186	1299	439	204	9447	670

(7)	(8)	
21	420	540
16	273	194
12	346	283
20	1320	625
69	2359 bus.	$1642

(9)

oxen	cows	sheep	horses	colts	calves	
10	16	143	0	0	0	first
		200	9	14	16	second
6	19		5			third
		150		8	11	
16	35	493	14	22	27	

16	oxen
35	cows
493	sheep
14	horses
22	colts
27	calves
607	

(10)	
50	300
75	525
125	1000
250	1825

SUBTRACTION. (Arith. 34.)

(11)	(12)		(13)	(15)
6415	175	3531	87	1799
5324	92	1945	64	1732
—	—	—	—	—
1091	83 hams	1586 lbs.	23	67

(16)		(17)		(18)
30	3127	1841	12	2345
18	1871	1492	5	928
—	—	—	—	—
12 casks	1256 galls.	349	7	1417

ADDITION AND SUBTRACTION. (Arith. 35.)

(19)	(20)		(21)		(22)
75	18	125	843	3265	54
47	38	64	843	2620	38
—	1	—	934	—	12
122	7	61	—	645	—
82	—		2620		104
—	64				100
40					—
					4 lose

(23)

		51	51
1841	1841	12	12
1829	1790	—	—
—	—	39 m. ol. than d.	63 joint ages
12 girl's a.	51 m. age		

(24)

358	358	393
35	54	304
—	—	—
393 c.of A's.span	304 c. of B's.span	89 A's. span cost more than B's.

MULTIPLICATION. (Arith. 35.)

(25)	(26)	(27)	(28)	(29)
125	43	12	43	324
15	3	84	41	38
625	129	48	43	2592
125		96	172	972
1875		1008	1763	12312

(30)	(31)	(32)	(33)	(34)
28	215	15	260	1360400
19	45	12	17	24
252	1075	180	1820	54416
28	860		260	27208
532	9675		4420	32649600

(35)	(36)	(37)
342	126	52
56	109	42
2052	1134	104
1710	126	208
19152	13734	2184
25	1007	246
95760	96138	13104
38304	13734	8736
		4368
478800	13830138	537264
		9
		4835376

MULTIPLICATION, ADDITION, AND SUBTRACTION.

(Arith. 36.)

```
  (38)                             (39)

 45    30     4     3    15     32           136
  8     5     8    11     2     33            25
 ---  ----    --    --    --     30          ----
 360  150    32    33    30      6           680
 150                            25          272
 ---                            10          ----
 510                            --          3400
                               136 acres

  (40)                      (41)
 16   54        45    32   5   32     45   256
  3   48         6     8   9    5     37    45
 --   --       ---   ---  --   --     --    56
 48    6 gain  270   256  45   37      8   ---
                                       7   357
                                      --   270
                                      56   ---
                                            87
```

DIVISION. (Arith. 36.)

```
  (42)        (43)         (44)        (45)
 4)936      16)272(17     7)371    23)3772(164
  ----          16         ----       23
   234         ---           53       ---
               112                    147
 (46)          112                    138
26)156(6       ---                    ---
   156                                  92
   ---                                  92
                                        --
```

(47)

245)25300(103
245
800
735
65 rem.

(48)

136)3264(24
272
544
544

(49)

855)4275(5
4275

(50)

6)18624
3104

ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION. (Arith. 37.)

(51)

257
274
195
3)726
242

(52)

15 22
4 3
60 66
66
2)126
63

(53)

4500
524
4)3976
994

(54)

180)61200(340 farms
540
720
720
0

340
9
3060

(55)

50
25
60
135

200
135
65

(56)

14)2072(148
14
67
56
112
112

2072
12
24864

(57)

120
16
72
12
1920

343
8
2744
1920
4664

MIXED NUMBERS. (Arith. 38.)

(58)

$$\begin{array}{r} 2)54 \\ 5\frac{1}{2} \\ \hline 27 \\ 270 \\ \hline 297 \\ \hline \end{array}$$

(59)

$$\begin{array}{r} 3)103 \\ 6\frac{1}{3} \\ \hline 34\frac{1}{3} \\ 618 \\ \hline 652\frac{1}{3} \\ \hline \end{array}$$

(60)

$$\begin{array}{r} 2)320 \\ 5\frac{1}{2} \\ \hline 160 \\ 1600 \\ \hline 1760 \\ \hline \end{array}$$

(61)

$$\begin{array}{r} 54\frac{1}{4} \\ 4)\ 4 \\ \hline 1 \\ 216 \\ \hline 217 \\ \hline \end{array}$$

(62)

$$\begin{array}{r} 3\frac{1}{2} \\ 2 \\ \hline 7 \end{array} \qquad \begin{array}{r} 441 \\ 2 \\ \hline 7)882 \\ \hline 126 \\ \hline \end{array}$$

(63)

$$\begin{array}{r} 28\frac{5}{8} \\ 6 \\ \hline 8)30 \\ \hline 3\frac{6}{8} \\ 168 \\ \hline 171\frac{6}{8} \text{ or } \frac{3}{4} \\ \hline \end{array}$$

(64)

$$\begin{array}{r} 25\frac{3}{4} \\ 4 \\ \hline 103 \\ \hline \end{array} \qquad \begin{array}{r} 2472 \\ 4 \\ \hline 103)9888(96 \\ 927 \\ \hline 618 \\ 618 \\ \hline \end{array}$$

(65)

$$\begin{array}{r} 175 \\ 6\frac{3}{4} \\ \hline 4)525 \\ \hline 131\frac{1}{4} \\ 1050 \\ \hline 1181\frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 25000 \\ 5 \\ \hline 8)125000 \\ \hline 15625 \end{array}$$

(66)

$$\begin{array}{r} 25000 \\ 15625 \\ \hline 9375 \\ 3 \\ \hline 25)28125(1125 \\ 25 \\ \hline 31 \\ 25 \\ \hline 62 \\ 50 \\ \hline 125 \\ 125 \end{array}$$

QUESTIONS INDICATED BY THE SIGNS. (Arith. 41.)

(1)
54
132
97
283

(2)
358764
186374
172390

(3)
86972
1204
347888
173944
86972
104714288

(5)
58318
843106
2014
903438
131214
772224

(4)
181232)138280016(763
1268624
1141761
1087392
543696
543696

(6)
4)644
161
7
1127
325
802

(7)
42
4
3)168
56
24
80

(8)
88
25
9)63
7
4
28

(9)
54
66
6)120
20
57
77
3
231
121
110

(10)	(11)	(12)
221	4)16	256
3	—	182
—	4	—
663	216	438
128	—	73
—	220	—
5)535	7	365
—	—	12
107	1540	—
20	4	4380
—	—	1004
127	193)1544	—
16	—	3376
—	8	8
762	4	—
127	—	12)3384
—	4	—
4)2032	7	282
—	—	5
508	28	—
508	20	1410 *Ans.*
—	—	—
0 *Ans.*	48 *Ans.*	

ADDITION OF FEDERAL MONEY. (Arith. 42.)

(3)	(4)	(5)
$281 23cts.	$852 85cts. 2m.	$2212 58cts. 1m.

(6)	(7)	(8)		(9)
$110 30cts.	$	$	cts.	cts.
	326	45	30	4
	184	20	12	12
	1000	3000	1	83
	83	600	34	16
	—	—	—	10
	1593	3665	77	—
				$1 25cts

(10)

$.	cts.	m.
1	12	5
	18	7
2	36	
11	8	3
14	75	5

(11)

$.	cts.	m.
342	83	5
	86	
143	00	
1	00	5
101	06	
588	76	0

(12)

$	cts.
5	00
3	50
15	50
8	50
32	50

(13)

$	cts.
3420	64
100	49
3521	13

(14)

$	cts.	m.
	25	
1	12	5
	75	
	31	
	1	
	50	
2	94	5

(15)

	$	cts.	m.
A	27	30	
B	60	50	9
C	50	98	
D	100	0	7
E	7	4	8
F	30	75	
G	48	20	
H	73	27	
	398	06	4

SUBTRACTION OF FEDERAL MONEY. (Arith. 44.)

(4) $333 63cts. 8m.

(5) $36 33cts. 9m.

(6) $3 80cts. 6m.

(7) $53 27cts 1m.

(8) $49 60cts.

(9) $99 99cts. 9m.

(10)

$
1000
326
674

(11)

$	cts.
125	00
9	09
115	91

(12)

$	cts.
127	01
41	10
85	91

(13)	(14)	(15)
$ cts.	$ cts. m.	$ cts.
41 08	100 00 0	20 00
1 09	1	20
39 99	99 99 9	19 80

APPLICATION.

(16)	(17)	(18)		(19)
$ cts.	$ cts. m.	bus.	$ cts.	$
2 06	526 37 5	356	700 00	4700
50	426	200	380 56	1002
1 56	100 37 5	156	319 44	3698

MULTIPLICATION OF FEDERAL MONEY. (Arith. 45.)

(4)	(5)	(6)
$1026 36cts.	$2125 67cts.	$1423 87cts.

(7)	(8)	(9)	(10)
$ cts. m.	$	$ cts.	$ cts. m.
87 26 4	5000	42 28	136 00 5
2 8	6	3	8
698 11 2	30000	126 84	1088 04 0
1745 28			
$2443 39 2			

(11)	(12)	(13)
$ cts.	$ cts. m.	$ cts. m.
29 50	300 30 3	41 51 8
12	14	76
354 00	1201212	249108
	300303	290626
	$4204 24 2	$3155 36 8

(14)

$ cts. m.
365 14 4
123
1095432
730288
365144
$44912 71 2

(15)

$ cts. m.
29 08 3
138
232664
87249
29083
4013 45 4

APPLICATION.

(1)

½)14
12½
7
168
$1 75cts.

(2)

50
5
$2 50

(3)

$ cts.
4 50
8
$36 00

(4)

94
33
282
282
$31 02

(5)

37
52
74
185
$1924

(6)

$ cts.
7 14
60
$428 40

(7)

$ cts.
36 50
125
18250
7300
3650
$4562 50

(8)

$ cts. — $ cts.
28 × 2 15 = 60 20
41 × 0 21 = 8 61
34 × 0 19 = 6 46
13 × 7 31 = 95 03
35 × 7 14 = 249 90
27 × 1 04 = 28 08
94 × 0 33 = 31 02
29 × 1 12 = 32 48
$511 78

DIVISION OF FEDERAL MONEY. (Arith. 47.)

(4) $57 13 5$\frac{4}{6}$ (5) $4 67 3 (6) $133 11 3$\frac{1}{4}$
(7) $7 25 3$\frac{7}{12}$ (8) $8 6 1$\frac{3}{7}$

(9)

$ cts. $ cts.
16)1784 64(111 54
16
18
16
24
16
86
80
64
64

(12)

$ cts. m. cts. m.
138)53 49 9(38 7
414
1209
1104
1059
966
93+

(10)

$ cts. m. $ cts. m.
28)365 24 2(13 04 4
28
85
84
124
112
122
112
10+

(11)

$ cts. m. $ cts. r
38)186 30 4(4 90
152
343
342
104
76
28+

(13)

$ cts. m. cts. m.
473)156 50 2(33 0
1419
1460
1419
412+

APPLICATION.

(14)

$ cts $ cts.

24)52 24(2 17
48
—
42
24
—
184
168
—
16+

(15)

$ cts. m.

40)72 34 0
1 80 8$\frac{20}{40}$

(16)

$. cts. cts.

15)6 00(40
60
—
0

(18)

$ cts. m. cts. m.

144)90 00 0(62 5
864
—
360
288
—
720
720

(17)

$ cts. cts.

235)58 75(25
470
—
1175
1175

PROMISCUOUS QUESTIONS. (Arith. 48.)

(1)

		$ cts.	$ cts.
Oxen			75 00
Steers	3×27		=81 00
Sheep	25×	2 75	=68 75
			224 75

(2)

		$ cts.	$ cts.
Cows	4×23		=92 00
Sheep	15×	3 50	=52 50
Horse			56
			200 50
ploughs	18×5 75		103 50
			97

(3)

```
        $    cts.
       2922 50
        500
       -------
  125)3422 50(27 38
       250
       ----
        922
        875
        ----
         475
         375
         ----
         1000
         1000
         ----
```

(4)

```
   $  cts.
   23 50
     125
  -------
   11750
   4700
  2350
  -------
  2937 50
   450
  -------
  2487 50
  -------
```

(5)

```
 250           $  cts.
   14 73      500 00
  18          472 31
  43 18      -------
  87 40        27 69
  59          ------
 -------
 472 31
 -------
```

(6)

```
  178       170       89       106
    2         2        5         8
  ----      ----     ----      ----
  356     2)340      445       848
    6         5½     ----      445
  ----      ----              1870
 2136       170               2136
 ----      1700               ----
           ----             $52 99
           1870              ----
           ----
```

(7)

28
57

196
140

1596
15

7980
1596

650)23940(36
1950

4440
3900

540

COMPOUND ADDITION. (Arith. 53.)

ENGLISH MONEY.

(2) £203 11s. 9d. (3) £320 9s. 8½d.
(4) £1601 18s. 6¾d. (5) £219 12s. 2¼d.
(6) £2983 12s. 11¾d.

(7)

£	s.	d.
35	12	2
66	13	
352	17	
2	13	2½
£457	15	4½

(8)

£	s.	d.
145	0	0
72	0	8
15	9	8½
	18	5¾
43	2	3¾
£276	11	2

TROY WEIGHT.

(9)

lb.	oz.	dwt.	gr.
29	11	13	14

(10)

lb.	oz.	dwt.	gr.
278	9	18	23

(11)

lb.	oz.	dwt.	gr.
2	11	10	2
15	10	2	
145	2	2	
163	11	14	2

(12)

lb.	oz.	dwt.
14	3	
3	0	13
16	5	14
25	6	
59	3	7

AVOIRDUPOIS WEIGHT.

(13)

T.	cwt.	qr.
88	18	0

(15)

T.	cwt.	qr.
30	2	2
13	0	2
3	15	0
46	18	0

(16)

Cwt.	qr.	lb.
13	3	27
17	0	10
1	0	15
32	1	2

(14)

Cwt.	qr.	lb.	oz.	dr.
148	1	13	1	7

APOTHECARIES WEIGHT. (Arith. 54.)

(17)

℔	℥	ʒ	℈	gr.
206	7	0	2	19

(18)

℔	℥	ʒ	℈	gr.
19	10	1	2	6

(19)

℔	℥	ʒ	℈
11	0	7	1
15	10	2	0
54	4	0	0
46	0	0	2
127	3	2	0

(20)

℔	℥	ʒ	℈	gr.
15	9	0	0	0
1	0	0	0	12
	8	7	2	
		4	0	12
17	6	4	0	4

CLOTH MEASURE.

(21)

Yd.	qr.	na.
78	1	0

(22)

E. E.	qr.	na.
82	3	3

(23)

E. Fl.	qr.	na.
80	0	3

(24)

Yd.	q.	na.
15	3	2
45	2	
1	0	3
125		
187	2	1

(25)

E. E.	qr.	na.
14	3	0
25	2	3
	3	1
40	4	0

LONG MEASURE. (Arith. 55.)

(26)

Yd.	ft.	in.
18	1	8

(27)

Le.	m.	fur.	pol.
285	2	3	12

(28)

Le.	m.	fur.	pol.
13	2	6	0
4	0	4	32
1	2	0	18
20	0	0	0
39	2	3	10

(29)

Yd.	ft.	in.
2	1	9
1	0	11
	1	6
10	0	5
14	1	7

LAND MEASURE.

(30)

A.	r.	p.
610	0	30

(31)

Yd.	ft.
59	1

(32)

A	r.	p.
125	3	0
401	2	28
56	0	20
540	0	0
1123	2	8

(33)

Yd.	ft.
15	6
2	7
16	2
28	
62	6

SOLID OR CUBIC MEASURE.

(35)

Cord.	ft.	in.
108	110	1518

(37)

Cord.	ft.	in.
75	94	1172
364	74	246
	49	812
113	0	0
553	90	502

Hewn timber.

(36)

Ton.	ft.	in.
36	45	0
	36	0
	1	1641
	32	945
38	15	858

Round timber.

(34)

Ton.	ft.	in.
85	30	706

LIQUID MEASURE. (Arith. 56.)

(38)

T.	hhd.	gal.	qt.
84	2	40	3

(39)

Gal.	qt.	pt.
62	1	1

(40)

T.	hhd.	gal.
11	3	16
4	2	9
14	2	40
31	0	2

(41)

Gal.	qt.	pt.
14	3	1
25	2	0
2	0	1
23	0	0
65	2	0

DRY MEASURE.

(42)

bu.	p.	qt.
908	0	4

(43)

bu.	p.	qt	pt.
200	1	5	1

(44)

bu.	p.	qt.
116	3	6
341	1	0
40	0	6
375	0	0
873	1	4

(45)

bu.	p.	qt.	p.
3	3	4	1
6	1	2	0
	1	5	1
10	2	4	0

TIME.

(46)

w.	d.	h.	m.
13	4	2	21

(47)

d.	h.	m.	sec.
11	5	28	44

(48)

y.	m.
20	4
45	6
81	10
16	0
100	0
263	8

(49)

w.	d.	h.	m.
6	1	5	45
3	4	20	0
	3	18	14
		8	0
10	3	3	59

MOTION.

(50)

°	′	″
219	49	14

(51)

S.	°	′	″
32	21	52	36

PROMISCUOUS EXAMPLES. (Arith. 57.)

(52)

s.	d.
8	6½
6	8
4	6
2	6
3	6½
£1 5	9

(53)

lb.	oz.	dwt.
16	10	13
35	10	11
2	10	0
55	7	4

(54)

Cwt.	qr.	lb.
9	2	18
8	3	12
7	2	19
26	0	24

(55)

m.	fur.	p.
27	2	0
32	7	33
19	7	16
12	5	0
92	6	9

(56)

A.	r.	p.
120	3	
150	0	
215	1	
96	2	20
582	2	20

(57)

y.	m.	w.	d.
18	0	3	0
			2
3	6	0	0
			1
1	2	3	0
			5
12	0	0	6
		2	0
34	10	2	0

COMPOUND SUBTRACTION.

ENGLISH MONEY. (Arith. 58.)

(2)

£.	s.	d.
22	4	10½

(3)

£.	s.	d.
111	14	0¾

(4)

£.	s.	d.
12	10	7¾

(5)

£.	s.	d.
21	3	6¼

(6)

£.	s.	d.
999	19	11¼

(7)

£.	s.	d.
10000	18	6¾
8000	14	
2000	4	6¾

(8)

£.	s.
86	0
	1
85	19

TROY WEIGHT.

(9)

lb.	oz.	dwt.	gr.
17	4	9	16

(10)

lb.	oz.	dwt.	gr.
29	0	6	20

(11)

lb.	oz.	dwt.
125	4	16
18	6	
106	10	16

(12)

lb.	oz.	dwt.	gr.
15	0	0	3
1	3	10	16
13	8	9	11

AVOIRDUPOIS WEIGHT. (Arith. 59.)

(13)

T.	c.	qr.	lb.
27	18	0	17

(14)

C.	qr.	lb.	oz.	dr.
10	1	15	15	6

(15)

T.	c.	qr.
183	1	3
76	18	3
106	3	0

(16)

lb.	oz.	dr.
20	2	
15	4	6
4	13	10

APOTHECARIES WEIGHT.

(17)

℔	℥	ʒ	℈	gr.
2	3	1	0	13

(18)

℔	℥	ʒ	℈	gr.
11	3	4	2	2

(19)

℔	℥	ʒ
24	10	3
16	5	6
8	4	5

(20)

℔	℥	ʒ	℈	gr.
8	6	1	0	4
	3	2	1	
8	2	6	2	4

CLOTH MEASURE.

(21)

yd.	qr.	n.
11	2	2

(22)

E.E.	qr.	n.
25	2	2

(23)

E.F.	qr.	n.
3	5	1

(24)

yd.	qr.	n.
137	3	3
95	3	2
42	0	1

(25)

E.E.	qr.	n.
83	1	2
12	2	1
70	4	1

LONG MEASURE. (Arith. 60.)

(26)

L.	m.	fur.	p.
20	1	7	6

(27)

yd.	ft.	in.
2	2	9

(28)

m.	fur.	p.
420	3	25
43	5	22
376	6	3

(29)

yds.	ft.	in
37	0	8
15	1	3
21	2	5

LAND MEASURE.

(30)

A.	r.	p.
167	3	0

(31)

A.	r.	p.
22	0	22

(32)

A.	r.	p.
800	1	16
32	2	
767	3	16

(33)

A.	r.	p.
365	1	30
83		
282	1	30

SOLID OR CUBIC MEASURE.

(34)

Tons.	ft.	in.
16	44	1165

(35)

Cords.	ft.	in.
17	118	836

(36)

Tons.	ft.	in.
30	8	127
13	15	
16	43	127

(37)

Cords.	ft.	in.
183	2	137
18	8	1119
164	121	746

LIQUID MEASURE.

(38)

T.	hhd.	gal.	qt.
18	1	47	3

(39)

gal.	qt.	pt.
54	2	1

(40)

T.	hhd.	gal.
30	2	12
14	3	10
15	3	2

(41)

hhd.	gal.	qt.	pt.
85	13	3	1
21	0	2	
64	13	1	1

DRY MEASURE. (Arith. 61.)

(42)

bu.	pe.	qt.
57	2	7

(43)

P.	qt.	pt.
1	6	1

(44)

bu.	pe.	qt.
173	0	0
123	2	1
49	1	7

(45)

bu.	pe.
601	2
321	0
280	2

TIME.

(46)

y.	m.	w.	d.	h.
61	7	2	1	23

(47)

d.	h.	m.	sec.
67	20	8	51

(48)

y.	m.
365	6
125	9
239	9

(49)

d.	h.	m.
201	19	0
131	18	30
70	0	30

MOTION.

(50)

S.	°	′	″
6	16	4	58

(51)

S.	°	′	″
2	29	54	18

APPLICATION. (Arith. 61.)

(52)

£.	s.	d.
2000		
1893	0	0 ¾
106	19	11 ¼

(53)

lb.	oz.	dwt.	gr.
34	9	10	0
19	0	15	10
15	8	14	14

(54)

℔	℥	ʒ	℈	gr.
6	10	6	2	0
4	5	4	1	17
2	5	2	0	3

(55)

m.	fur.	p.
30	1	15
18	3	30
11	5	25

(56)

yd.	qr.	na.
145	3	0
95	2	3
50	0	1

(57)

A.	r.	p.
500	1	0
150	3	25
349	1	15

(58)

gal.	qt.	pt.
154	2	0
41	2	1
112	3	1

(59)

bus.	p.	qt.
283	0	0
153	2	5
129	1	3

(60)

y.	mo.
7	0
3	5
3	7

(62)

y.	m.	d.
1808	9	18
1789	8	20
19	0	28

(63)

y.	m.	d.
1815	3	12
1809	5	21
5	9	21

COMPOUND MULTIPLICATION. (Arith. 63.)

CASE I.

	£	s.	d.
(3)	32	6	6

	£	s.	d.
(4)	311	6	10½

	£	s.	d.
(5)	249	8	6¼

	lb.	oz.	dwt.	gr.
(6)	52	4	16	18

	T.	cwt.	qr.	lb.	oz.	dr.
(7)	23	6	1	23	7	8

	L.	m.	fur.
(8)	95	2	2

	yd.	ft.	in.	bc.
(9)	102	1	2	2

	yd.	qr.	na.
(10)	143	3	0

	A	r.	pr.
(11)	430	2	15

	B.	p.	qt.
(12)	33	1	6

	W.	d.	h.	m.	sec.
(13)	15	6	6	1	20

	D.	′	″
(14)	242	1	36

CASE II. (Arith. 64.)

(16)

6×3=18

£	s.	d.
0	9	6
		6
2	17	0
		3
8	11	0

(17)

7×3=21

£	s.	d.
0	7	7½
		7
2	13	4½
		3
8	0	1½

(18)

7×5=35

T.	cwt.	qr.
40	11	3
		7
284	2	1
		5
1420	11	1

(19)

9×6=54

T.	cwt.	qr.
18	0	1
		9
162	2	1
		6
972	13	2

(20)

11×6=66

yd.	ft.	in.
4	2	11
		11
54	2	1
		6
328	0	6

(21)

9×8=72

yd.	ft.	in.
3	1	8
		9
32	0	0
		8
256	0	0

CASE III. (Arith. 65.)

(24)

6×4+2=26

£	s.	d.
1	2	6×2
		6
6	15	0
		4
27	0	0
2	5	0
29	5	0

(25)

7×6+1=43

lb.	oz.	dwt.
1	10	11×1
		7
13	1	17
		6
78	11	2
1	10	11
80	9	13

(26)

6×6+1=37

lb.	oz.	dwt.
2	1	8×1
		6
12	8	8
		6
76	2	8
2	1	8
78	3	16

(27)

9×8+2=74

EE.	qr.	n.
4	1	2×2
		9
38	3	2
		8
309	3	0
8	3	0
318	1	0

(28)

12×8+1=97

EE.	qr.	n.
10	4	1×1
		12
130	1	0
		8
1041	3	0
10	4	1
1052	2	1

APPLICATION. (Arith. 65.)

(29)

```
 ℔  ℥  ʒ  ℈  gr.
 35  9  4  2  15
                3
 ---------------
107  4  6  2   5
 ---------------
```

(30)

```
 yd. qr. na.
 19  3   1
          9×3=27
 -----------
178  1   1
         3
 -----------
534  3   3
 -----------
```

(31)

```
4×4+1=17
 M.   fur.  po.
 32    4    16×1
             4
 ---------------
130    1    24
             4
 ---------------
520    6    16
 32    4    16
 ---------------
553    2    32
 ---------------
```

(32)

```
  A.    r.   p.
 150    3   12
             7
 --------------
1055    3    4
 --------------
```

(33)

```
gal.  qts.
 31    2
          9×5=45
 ----------
283    2
       5
 ----------
1417   2
```

(34)

```
 W.   d.   h.
 52   1    6
           8
 -------------
417   3    0
 -------------
```

(35)

```
 £    s.   d.
 6    17   4½
          10
 -------------
68    13   9
 -------------
```

(36)

```
lb.  oz.  dwt.  gr.
 4    1    15   22
                11
 ------------------
45    7    15    2
 ------------------
```

(37)

```
Cwt.  qr.  lb.
 11    2   16
            5
 --------------
 58    1    5
 --------------
```

COMPOUND DIVISION. (Arith. 67.)

(2)
£ s. d.
23 17 4

(3)
£ s. d.
22 6 $7\frac{3}{4}$

(4)
£ s. d.
11 19 $3\frac{3}{4}$+

(5)
£ s. d.
5 15 $6\frac{1}{4}$+

(6)
£ s. d.
38 9 $0\frac{1}{4}$+

(7)
lb. oz. dwt. gr.
12 10 16 17

(8)
T. C. qr. lb. oz. dr.
14 12 2 15 3 18+

(9)
Le. m. fur. pol.
84 0 2 18+

(10)
A. r. p.
10 1 17+

(11)
yd. qr. na.
9 1 3+

(12)
T. hhd. gal. qt. pt.
2 3 60 2 0+

(13)
W. d. h. m. sec.
1 6 23 42 36+

CASE II. (Arith. 68.)

(16)
£ s. d.
21 { 3)29 15 0
7)9 18 4
1 8 4

(17)
£ s. d.
32 { 4)27 16 0
8)6 19 0
17 $4\frac{1}{2}$

(18)
T. hhd. gal.
44 { 4)11 3 16
11)2 3 51+
1 4+

(19)
T. hhd. gal.
56 { 7)269 1 12
8)38 1 55+
4 3 14+

(20)
A. r. pol.
121 { 11)150 3 15
11)13 2 34+
1 0 39+

(21)
A. r. pol.
144 { 12)16 2 8
12)1 1 20+
0 0 18+

(4*)

CASE III. (Arith. 69.)

(23)

```
 £   s.  d.  £. s. d.
31)113 13 4(3 13 4 Ans.
   93
   --
   20
    20×
   ---
31)413(13s.
   31
   ---
   103
    93
   ---
    10
    12×
   ---
31)124(4d.
   124
   ---
```

(24)

```
   B. p. qt. B. p. qt.
47)38 3 1(0 3 2 Ans.
    4×
   ---
47)155(3p.
   141
   ---
    14
     8×
   ---
47)113(2qt.
    94
   ---
    19+
   ---
```

(25)

```
   B.  p. qt. B. p. qt.
95)189 0  2(1  3  7 Ans.
   95
   --
   94
    4×
   ---
95)376(3p.
   285
   ---
    91
     8
   ---
95)730(7qt.
   665
   ---
    65+
```

(26)
Y. mo. w. Y. mo. w.
147)47 2 2(0 3 3 *Ans.*
12×
147)566(3mo.
441
125
4×
147)502(3w.
441
61+

(27)
Y. mo. w. Y. mo. w.
654)3236 9 3(4 11 1 *Ans.*
2616
620
12×
654)7449(11mo.
654
909
654
255
4×
654)1023(1w.
654
369

APPLICATION. (Arith. 69.)

(28)
£ s. d.
8)3 11 8
8 11½

(29)
£ s. d.
42 { 6)17 13 6
7)2 18 11
8 5

(30)
bu. p. qt.
16 { 4)450 3 2
4)112 2 6
28 0 5+

(31)
m. f. po.
12)160 2 28
13 2 35+

(33)

W. d. h. w. d. h.
13)52 1 6(4 0 2 *Ans.*
52
1
24×
13)30(2
26
4+

(32)

Acres. A. r. po.
428)73492(171 2 33*Ans.*
428
3069
2996
732
428
304
4×
428)1216(2
856
360
40×
428)14400(33
1284
1560
1284
276+

PROMISCUOUS EXAMPLES IN COMPOUND ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION. (Arith. 70.)

(35)

£	s.	d.		yds.		£.	s.	d.
2	14	0	×	8	=	21	12	0
1	13	4	×	12	=	20	0	0
						£41	12	0 *Ans.*

(34)

30
25
½)55
93½
27½
165
495
$51 42½

(36)

£	s.	d.
25	10	0
76	18	9
175	10	0
100		
£377	18	9 owes in all.

£	s.	d.
500	18	9
377	18	9
£123		*Ans.*

(37)

lb.		bags.		lb.
120	×	10	=	1200
145	×	3	=	435
				1635
			sells	630
			remains	1005 *Ans.*

(38)

Yd.	qr.		pieces.		yd.	qr.
21	3	×	4	=	87	0
35	2	×	3	=	106	2
					193	2
				sold	141	
				remains	52	2 *Ans.*

(39)

	Ar.	r.	pr.
	125	3	0
	200	2	18
	175	0	10
	2)501	1	28
Acres	250	2	34 *Ans.*

(40)

$	cts.
3128	16
300	75
3)2827	41
$942	47 *Ans.*

REDUCTION. (Arith. 75.)

			$ cts. m.
(11)	64080	(15)	57 03 0
(12)	5432	(16)	16 32 1
(13)	140000	(17)	1 83 7
(14)	15006	(18)	7 42 0
	224518		$82 60 8

(21) 248×12= 2976
(22) 238÷ 7= 34
(23) 246÷ 3= 82
(24) 420÷12= 35
(25) 360× 3= 1080
(26) 360÷20= 18
(27) 624×63= 39312
(28) 1200÷25= 48
(29) 471÷ 3= 157
(30) 254÷ 2= 127
(31) 2220÷60= 37
(32) 48× 8= 384
(33) 252÷ 7= 36
(34) 252× 4= 1008
(35) 522÷ 9= 58
(36) 46200×50=2310000

(37)
£
532
20
10640 s.
12
127680 d.

(38)
yds.
95
4
380 qr.
4
1520 na.

(39)
acres.
40
4
160 ro.
40
6400 per.

(40)
gr.
24)12960
2]0)54[0
27 oz.

(41)
miles.
12960
8
103680
40
4147200 po.

(42)
gal.
63)2268
4)36
9 tuns

Note.—In dividing by 63 the quotient only is put down, the scholar must divide the 63 by long division; and in multiplying by two or more figures the product only will generally be put down.

(43)
qts.
8)1888
4)236
59 bush.

(44)
weeks.
41
7
287
24
6888
60
413280 min.

(45)
bush.
136
4
544
8
4352
2
8704 pts

(46)
£
24
20
480
12
5760
4
23040 far.

(49)
£ s. d.
124 16 8¾
20
2496
12
29960
4
119843 far.

(50)
yds. qr. na.
17 1 2
4
69
4
278 na.

(51)
cwt. qr. lb.
89 3 14
4
359
25
8989 lb.

(52)
dwt.
2]0)1148[0
12)574
47 lb. 10 oz.

(53)
in.
12)4352
3)362 8
120 yds. 2 ft. 8 in.

(54)
£. s. d.
8 0 3
20
160
12
1923 pen.

(55)
per.
4]0)439[2
4)109 32
27 ac. 1 r. 32 per.

(56)
tons.
14
50
700
1728
1209600 in.

(57)
feet.
128)4608
36 cords

(58)
sec.
6]0)12181[2
6]0)203[0 12
33 h. 50 m. 12 sec.

(59)
days ho.
365 6
24
8766
60
525960
60
31557600 sec.

(60)
5½ 682
2 2
11)1364
124 po.

(61)
bar.-co.
3)2280060
12)760020
3)63335
5½. 21111 2
2 2
11) 42222
4]0)383[8 4 or 2yds.
8)95 38
11m. 7fur. 38po. 2yd. 2ft.

(62)
miles.
160
8
1280
40
2)51200
5½
25600
256000
281600
3
844800
12
10137600in.

(63)
£ s.
15 3
20
303
12
3636 pence

(64)
na.
4)3783
4)945 3
236yds. 1q. 3na.

(67)
cwt. lb.
11 23
100
1123
12
13476lb.

(65)
bbls.
8
31½
4
248
252
4
1008
2
2016pts.

(66)
ft.
96
5
480
4
128)1920
15 cords

(68)
na.
4)5932
5)1483
296ell. 3qr.

(69)
a. r.
24 0
17 3
6 1
4
25
40
1000

(70)
b. p.
3 3
4
15

b.
720
4
15)2880
192bbls.

(71)
signs.
6
30
180
60
10800min.

(72)
inches.
1728)5667840
4]0)328[0
82 tons

(73)
cwt.
27
100
18)2700
150parc.

(74)

deg.
360
69½
25020
8
200160
40
8006400
5½
44035200
3
132105600
12
1585267200
3
4755801600b.c.

(75)

year.
4)1841
365¼
460¼ or 6ho.
9205
11046
5523
672425da. 6ho.

(76)

	mo.		days.
March	3	=	29
April	4	=	30
May	5	=	31
June	6	=	30
July	7	=	31
Aug.	8	=	31
Sept.	9	=	30
Oct.	10	=	31
Nov.	11	=	19
			262 days

CHANGING OF CURRENCIES. (Arith. 79.)

(79) £63 15s.=1275s.÷6s. or $1=212.50 *Ans.*
(80) £431=8620s.÷8s. or $1=$1077.50 *Ans.*
(81) £28 11s. 6d.=1143sp.÷12sp. or $1=$95.25.
(82) £53 18s. =12936 d.÷56d. or $1=$231. *Ans.*
(83) £37 10s. =9000d.÷90d. or $1=$100 *Ans.*
(84) £214 10s. 7½d.=102975hp.÷192hp. or $1or 8s =536.32 $8\frac{24}{192}$ *Ans.*

(85) £20 18s. $5\frac{3}{4}$=20087far.÷288far. or $1 or 6s.= $69.74 $6\frac{188}{288}$

RULE II. (Arith. 80.)

(87) $438.42×96d. or $1=4208832÷100 or cut off two figures=42088d.÷12÷20=£175 7s. 4d. Then the 32×4 and two figures cut off=$\frac{1}{4}$ and 28 rem'd.

(88) $1971 96×72 pence or $1=141981(12÷12÷20 =£591 11s. 9d. *Ans.*

(89) $315.44×90pence or $1=28389(60÷12÷20= £118 5s. $9\frac{1}{2}$d. *Ans.*

(90) $525.40×56d. or $1=29422(40÷12÷20= £122 11s. $10\frac{1}{4}$d. *Ans.*

(91) $85.43×54d. or $1=4613(22÷12÷20=£19 4s. 5d. *Ans.*

(92) $254.28×96d. or $1=24410(88÷12÷20= £101 14s. $2\frac{3}{4}$d. *Ans.*

(94) $721×6s. or $1=4326÷20=£216 6s. *Ans.*

(95) $674×8s. or $1=5392÷20=£269 12s. *Ans.*

QUESTIONS IN REDUCTION. (Arith. 81.)

(96) 352na.÷4=88qr.÷4=22yds. *Ans.*

(97) 6T.×20=120cwt.×100=12000lb. *Ans.*

(98) 3Le. 2m. 7fur.×3=11m.×8=95fur. *Ans.*

(99) $\frac{1}{2}$lb.=8oz.×16=128 drams. *Ans.*

(100) 11Ac.×4=44ro.×40=1760per. *Ans.*

(101) £65 17s. 4d.×20=1317s.×12=15808d.÷72 =$219.55 $5\frac{5}{9}$ *Ans.*

(102) 72hhds.×63=4536gal.×4=18144qts. *Ans.*

(103) 8lb. 10oz. 5dwt.×12=106oz.×20=2125dwt.

(104) 7cwt. 14lb.×100=714lb. *Ans.*

(105) 362yds.×4=1448qts.×4=5792na. *Ans.*

(106) 4732ho.÷24=197da. 4ho.÷7=28w. 1da. 4ho.

(107) $437.10×96d. or $1=41961(60÷12÷20=£174 16s. 9½d. *Ans.*

(108) 15yds. 2ft.×3=47ft.×12=564in. *Ans.*

(109) 27d. 7h. 43m. 5s.×24=655ho.×60=39343m.×60=2360585sec. *Ans.*

(110) 222÷4=55cwt. 2qr.÷20=2tons, 15cwt. 2qr.

(111) 1oz.×20×24=480grs. *Ans.*

(112) 37Mi. 0fur. 21po. 0yd. 0ft. 6in.×8=296fur.×40=11861pol.×5½=65235½yds. the ½yd. is 1ft. 6in.×3=195706ft.×12=2348484in.×3=7045452b.c. *Ans.*

(113) 1597÷8÷4=49bus. 3p. 5qts. *Ans.*

(114) 4da, 12ho.×24=108ho.×60=6480min. *Ans.*

(115) 42E.Fr.×6×4=1008na. *Ans.*

PROMISCUOUS EXAMPLES. (Arith. 81.)

(116) £916 10s. 9¾d.×20=18330s.×12=219969d.×4=879879far. *Ans.*

(117) 11316157÷16=707259oz.13dr.÷16=44203lb. 11oz. ÷25=1768qr. 3lb.÷4=442cwt.÷20=22 tons, 2cwt. 0qr. 3lb. 11oz. 13dr. *Ans.*

(118) 892cwt. 3qr. 12lb.= 89287÷200=446bbls. 87 lbs. over. *Ans.*

(119) £124 8s.=2488s.÷8s. or $1=$311. *Ans.*

(120) 346guin.×21=7266s.×12=87192d. *Ans.*

(121) 5oz. 10dwt.×20=110dwt.; and 10lb. 1oz.×12=121oz.×20=2420dwt. Now 2420÷110=22 spoons. *Ans.*

(122) First add 1pt+1qt.or 2pts.+4pts or 2qts.=7pts. then 1pipe×2×63×4×2=1008pts.÷7=144 of each. *Ans.*

(123) First 1s.=12d.+9d.+6d.+4d.+1d.=32d.; now £50×20×12=12000d.÷32=375 of each.

(124) 4bales×12=48pie. ×24=1152E.E.×5=5760 qrs.÷4=1440yds.; and 5760qrs.÷3=1920E. Flem. *Ans.*

(125) 13s. 4d.×12=160d.; and £496 13s. 4d.×20 =9933s.×12=119200d.÷160=745marks.*Ans.*

(126) 250 pipes×2=500hhds.; 150 half hhd.÷2= =75hhds.; now 500+130+75=705hhds.×63 =44415gal. first *Ans.* Again 44415gal.×4×2 =355320pts.or lb.÷100=3553cwt. 20lb.÷20= 177tons 13cwt. 20lb. *Ans.*

(127) 4y. 1qr. 3n.=71n.×425men=30175na.÷4÷4 =1885yd. 3qr. 3n. *Ans.*

(128) First add 7acr.+10 acr.+12 a. 1r.=29a. 1r.× 4=117ro.×40=4680per.÷76=61shares 44per.

(129) First 18ft. 6in.×12=222in.; then 93m.×8= 744fur.×40=29760pol.×5½=163680yds.×3= 491040ft.×12=5892480÷222=26542times156 in. over. *Ans.*

(130) 1000000÷50=20000min.÷60=333ho. 20min. ÷24=13da. 21ho. 20m. *Ans.*

VULGAR FRACTIONS. (Arith. 83.)

Case I.

(2) 8)$\frac{144}{240}$=6)$\frac{18}{30}$=$\frac{3}{5}$ *Ans.*

(3) 5)$\frac{30}{125}$=$\frac{6}{25}$ *Ans.*

(4) 8)$\frac{48}{56}$=$\frac{6}{7}$ *Ans.*

(5) 162)$\frac{162}{324}$=$\frac{1}{2}$ *Ans.*

(6) 9)$\frac{216}{288}$=4)$\frac{24}{32}$=2)$\frac{6}{8}$=$\frac{3}{4}$ *Ans.*

(7) 4)$\frac{208}{684}$=$\frac{52}{171}$ *Ans.*

(8) 5)$\frac{45}{315}$=9)$\frac{9}{63}$=$\frac{1}{7}$ *Ans.*

(9) 5)$\frac{825}{960}$=3)$\frac{165}{192}$=$\frac{55}{64}$ *Ans.*

(10)

```
5184)6912(1
     5184
     ————
1728)5184(3
     5184
     ————
```

1728)$\frac{5184}{6912}$=$\frac{3}{4}$ *Ans.*

CASE II. (Arith. 84.)

(12) $16\times11+3=\frac{179}{11}$ (13) $5\times9+8=\frac{53}{9}$

(14) $18\times4+3=\frac{75}{4}$ (15) $126\times37+16=\frac{4678}{37}$

(16) $12\times8+5=\frac{101}{8}$ (17) $1\times20+13=\frac{33}{20}$

(18) $173\times144+106=\frac{25018}{144}$

CASE III. (Arith. 84.)

(20) $346\div23=15\frac{1}{23}$ (21) $128\div5=25\frac{3}{5}$

(22) $108\div12=9$ (23) $1651\div17=97\frac{2}{17}$

(24) $547\div28=19\frac{15}{28}$

CASE IV. (Arith. 85.)

(26) $\frac{\cancel{6}\ \ 1\ \ \overset{\cancel{2}}{\cancel{14}}}{\cancel{7}\ \ \cancel{2}\ \ \underset{4}{\cancel{24}}}=\frac{1}{4}$ (27) $\frac{\cancel{5}\ \ \overset{\overset{2}{\cancel{6}}}{\cancel{12}}\ \ \cancel{4}\ \ 7}{\underset{3}{\cancel{9}}\ \ 15\ \ \cancel{5}\ \ \underset{\cancel{2}}{\cancel{8}}}=\frac{2\times7}{3\times15}=\frac{14}{45}$

(28) $\frac{\cancel{7}\ \ \cancel{5}\ \ \overset{\cancel{9}}{\cancel{18}}\ \ \cancel{4}}{\underset{\cancel{2}}{\cancel{8}}\ \ \cancel{9}\ \ \underset{7}{\cancel{35}}\ \ \cancel{7}}=\frac{1}{7}$ *Ans.* (29) $\frac{\cancel{4}\ \ \cancel{2}\ \ 1\ \ \overset{\cancel{15}\ 5}{\cancel{75}}}{\cancel{5}\ \ \cancel{3}\ \ \cancel{2}\ \ \cancel{4}}$ *Ans.*

(30) $\frac{\cancel{5}\ \ \overset{\overset{2}{\cancel{6}}}{\cancel{12}}\ \ \cancel{4}\ \ 7}{\underset{3}{\cancel{9}}\ \ 13\ \ \cancel{5}\ \ \underset{\cancel{2}}{\cancel{8}}}$ and $\frac{2\times7}{3\times13}=\frac{14}{39}$ *Ans.*

(31) $\frac{1\ \ \cancel{5}\ \ \cancel{2}\ \ \cancel{7}\ \ \overset{\overset{\cancel{3}}{\cancel{9}}}{\cancel{27}}}{\cancel{3}\ \ \underset{\cancel{2}}{\cancel{6}}\ \ \cancel{7}\ \ \underset{\cancel{3}}{\cancel{15}}\ \ 1}=1$ *Ans.*

$$(32)\ \frac{\cancel{8}\ \cancel{5}\ \cancel{9}\ \overset{\cancel{2}}{\cancel{8}}\ 2\ \overset{3}{\cancel{27}}\ \cancel{4}\ \cancel{7}}{\cancel{9}\ 7\ \underset{5}{\cancel{10}}\ \underset{\cancel{3}}{\cancel{21}}\ \cancel{3}\ \underset{\cancel{4}}{\cancel{32}}\ \cancel{5}\ \underset{7}{\cancel{28}}}\ \text{and}\ \frac{2\times3}{7\times5\times7}=\frac{6}{245}$$

$$(33)\ \frac{\cancel{2}\ \overset{\cancel{2}}{\cancel{12}}\ 1\ \overset{8}{\cancel{16}}\ \cancel{3}\ \cancel{9}\ \overset{\cancel{2}}{\cancel{10}}\ \cancel{3}\ \cancel{5}\ \cancel{7}}{\cancel{5}\ 21\ \cancel{3}\ \cancel{3}\ \underset{\cancel{2}}{\cancel{4}}\ \underset{\underset{3}{\cancel{6}}}{\cancel{42}}\ 1\ \cancel{8}\ \cancel{6}\ \underset{\cancel{9}}{\cancel{18}}}\ \text{and}\ \frac{8}{21\times3=63}$$

Case v. (Arith. 86.)

(35)
3
20
—
4)60
—
15s. *Ans.*

(37)
4
16
—
7)64(9oz. $2\frac{2}{7}$dr. *Ans.*
63
—
1
16
—
7)16(2
14
—
2
—
7

(36)
2
12
— d qr.
5)24(4 $3\frac{1}{5}$
20
—
4
4
—
5)16(3
15
—
1
—
5

(38)
7
4
— qr. lb. oz. dr.
9)28(3 2 12 7$\frac{1}{9}$ *Ans.*
27
—
1
25
—
9)25(2
18
—
7
16
—
9)112(12
108
—
4
16
—
9)64(7
63
—
1
—
9

(39)
lb.
3
12
—
5)36(7oz.
35
—
1
20
—
5)20(4dwt.
20
—

(40)
m.
4
8
—
5)32(6fur.
30
—
2
40
—
5)80(16pol.
80
—

(41)
Acres.
5
4
—
8)20(2ro.
16
—
4
40
—
8)160(20per.
160

```
  (42)
  hhd.
    6
   63
  ---
7)378
  ---
  54gal.
  ---
```

```
   (43)
    mo.
     3
     4
    --
5)12(2wk.
  10
  --
   2
   7
  --
5)14(2da.
  10
  --
   4
  24
  --
5)96(19ho.
  95
  --
   1
  60
  --
5)60(12min.
  60
  --
```

MULTIPLICATION. (Arith. 87.)

CASE I.

(44) $\frac{1\times 2}{4}=\frac{2}{4}$ or $\frac{1}{2}$ *Ans.* (45) $\frac{3\times 4}{5}=\frac{12}{5}=2\frac{2}{5}$ *Ans.*

(46) $\frac{1\times 7}{8}=\frac{7}{8}$ *Ans.* (47) $\frac{8\times 12}{9}=\frac{96}{9}=10\frac{2}{3}$ *Ans*

(48) $\frac{7\times 5}{10}=\frac{35}{10}=3\frac{1}{2}$ *Ans.* (49) $\frac{13\times 3}{15}=\frac{39}{15}=2\frac{3}{5}$ *Ans.*

(50) $\frac{4\times16}{5}=\frac{64}{5}=12\frac{4}{5}$ *Ans.* (51) $\frac{3}{4\div2}=\frac{3}{2}=1\frac{1}{2}$ *Ans.*

(52) $\frac{2}{6\div3=2}\frac{2}{}=1$ *Ans.* (53) $\frac{4}{10\div5}=\frac{4}{2}=2$ *Ans.*

(54) $\frac{3}{21\div7}=\frac{3}{3}=1$ *Ans.* (55) $\frac{7}{128\div8}=\frac{7}{16}$ *Ans.*

CASE II. (Arith. 88.)

(57) $\frac{3}{5}\times\frac{9}{10}=\frac{27}{50}$ *Ans.* (58) $\frac{\cancel{2}}{7}\times\frac{3}{\underset{5}{\cancel{10}}}=\frac{3}{35}$ *Ans.*

(59) $\frac{\cancel{5}}{\underset{2}{\cancel{8}}}\times\frac{7}{\underset{3}{\cancel{9}}}\times\frac{\overset{3}{\cancel{12}}}{\underset{5}{\cancel{25}}}=\frac{}{2\times3\times5}=\frac{7}{30}$ *Ans.*

(60) $\frac{\cancel{2}}{\cancel{3}}\times\frac{\cancel{4}}{1}\times\frac{\cancel{3}}{\underset{\cancel{4}}{\cancel{8}}}\times\frac{\cancel{12}}{\cancel{15}}=\frac{4}{5}$ *Ans.*

(61) $\frac{\overset{11}{\cancel{33}}}{2}\times\frac{37}{\cancel{3}}=\frac{407}{2}=203\frac{1}{2}$ *Ans.*

(62) $\frac{7}{1}\times\frac{19}{5}=\frac{133}{5}=26\frac{3}{5}$ *Ans.*

(63) $\frac{\cancel{3}}{\cancel{4}}\times\frac{1}{\underset{\cancel{2}}{\cancel{6}}}\times\frac{\cancel{4}}{\cancel{5}}\times\frac{\overset{4}{\cancel{8}}}{\cancel{9}}\times\frac{\overset{\cancel{5}}{\cancel{45}}}{12}=\frac{4}{12}=\frac{1}{3}$ *Ans.*

(64) $\frac{\overset{3}{\cancel{9}}}{\cancel{10}}\times\frac{7}{1}\times\frac{\cancel{11}}{\underset{5}{\cancel{15}}}\times\frac{96\cancel{0}}{\cancel{11}}$ and $96\times7\times3=\frac{2016}{5}=403\frac{1}{5}$

APPLICATION. (Arith. 88.)

(65) First $2\frac{1}{2}=\frac{5}{2}$; $8\frac{3}{4}\times\frac{35}{4}$; then $\frac{5}{2}\times\frac{35}{4}=\frac{175}{8}=\$21\frac{7}{8}$

(66) First $8\frac{3}{4}=\frac{35}{4}$; $1\frac{1}{4}=\frac{5}{4}$; then $\frac{35}{4}\times\frac{5}{4}=\frac{175}{16}=\$10\frac{15}{16}$

(67) $\frac{23}{4}\times\frac{15}{4}=\frac{345}{16}=\$21\frac{9}{16}$ *Ans.*

(68) $\frac{204}{5}\times\frac{3}{8}=\frac{612}{40}=\$15.30$ *Ans.*

(69) $\frac{60}{7}\times\frac{84}{5}=\frac{5040}{35}=\$144$ *Ans.*

(70) $\frac{15}{4}\times\frac{15}{4}=\frac{225}{16}=\$14\frac{1}{16}$ *Ans.*

(71) $\frac{451}{4}\times\frac{3}{8}=\frac{1353}{32}=\$42.28\frac{1}{8}$ *Ans.*

(72) $\frac{365}{12}\times\frac{93}{8}=\frac{35359}{96}=\$353.59+$ *Ans.*

DIVISION. (Arith. 89.)

CASE I.

(1) $\frac{3\div3}{5}=\frac{1}{5}$ *Ans.*

(2) $\frac{4\div2}{9}=\frac{2}{9}$ *Ans.*

(3) $\frac{12\div6}{13}=\frac{2}{13}$ *Ans.*

(4) $\frac{8\div8}{15}=\frac{1}{15}$ *Ans.*

(5) $\frac{20\div5}{23}=\frac{4}{23}$ *Ans.*

(6) $\frac{16\div4}{27}=\frac{4}{27}$ *Ans*

(7) $\frac{3}{5\times4}=\frac{3}{20}$ *Ans.*

(8) $\frac{4}{9\times3}=\frac{4}{27}$ *Ans.*

(9) $\frac{5}{7\times6}=\frac{5}{42}$ *Ans.*

(10) $\frac{8\div2}{13}=\frac{4}{13}$ *Ans*

(11) $\frac{4}{7\times5}=\frac{4}{35}$ *Ans.* (12) $\frac{9}{14\times7}=\frac{9}{98}$ *Ans*

CASE II. (Arith. 89.)

(15) $\begin{array}{l}3)45\frac{4}{7}\\ \hline 15\end{array}\quad \frac{4}{7\times3=21}$ *Ans.*

(16) $\begin{array}{l}6)84\frac{12}{17}\\ \hline 14\end{array}\quad \frac{12\div6=2}{17}$ *Ans.*

(17) $\begin{array}{l}8)126\frac{4}{9}\\ \hline 15\end{array}\quad \frac{6\times9+4=58}{8\times9\ =\ 72}=\frac{29}{36}$ *Ans.*

(18) $\begin{array}{l}7)54\frac{3}{5}\\ \hline 7\end{array}\quad \frac{5\times5+3=28}{5\times7\ =\ 35}=\frac{4}{5}$ *Ans.*

(19) $\begin{array}{l}10)46\frac{7}{10}\\ \hline 4\end{array}\quad \frac{6\times10+7=67}{10\times10\ =100}$ *Ans.*

(20) $\begin{array}{l}2)243\frac{3}{4}\\ \hline 121\end{array}\quad \frac{4+3=7}{2\times4=8}$ *Ans.*

(21) $\begin{array}{l}12)84\frac{4}{7}\\ \hline 7\end{array}\quad 7\times12=\frac{4}{84}=\frac{1}{21}$ *Ans.*

(22) $3)92\frac{8}{15}$

$\overline{30}$ $15\times2+8=38$

—*Ans.*

$15\times3 = 45$

(24) $4)64\frac{8}{11}$

$\overline{16}$ $8\div4=2$

—*Ans.*

11

(23) $9)54\frac{1}{2}$

$\overline{6}$ $2\times9=18$

$\frac{1}{18}$ *Ans.*

CASE III. (Arith. 90.)

(26) $\frac{4}{5}\times\frac{3}{2}=\frac{12}{10}=1\frac{2}{10}$ or $\frac{1}{5}$ *Ans.*

(27) $\frac{5}{16}\times\frac{7}{5}=\frac{35}{80}=\frac{7}{16}$ *Ans.*

(28) $\frac{12}{1}\times\frac{9}{8}=\frac{108}{8}=13\frac{4}{8}$ or $\frac{1}{2}$ *Ans.*

(29) $\frac{14}{1}\times\frac{5}{3}=\frac{70}{3}=23\frac{1}{3}$ *Ans.*

(30) $\frac{8}{9}\times\frac{1}{12}=\frac{8}{108}=\frac{2}{27}$ *Ans.*

(31) $\frac{3}{5}\times\frac{1}{14}=\frac{3}{70}$ *Ans.*

(32) First $4\frac{3}{4}=\frac{19}{4}$ and $\frac{3}{4}$ of $\frac{6}{1}=\frac{18}{4}$ or $\frac{9}{2}$; then $\frac{19}{4}\times\frac{2}{9}=\frac{38}{36}=1\frac{2}{36}$ or $\frac{1}{18}$ *Ans.*

(33) First $\frac{3}{4}$ of $\frac{6}{1}=\frac{18}{4}$ or $\frac{9}{2}$, and $4\frac{3}{4}=\frac{19}{4}$; then $\frac{9}{2}\times\frac{4}{19}=\frac{36}{38}=\frac{18}{19}$ *Ans.*

(34) $\frac{1}{2}\times\frac{4}{7}\times\frac{5}{3}\times\frac{12}{7}=\frac{40}{49}$ *Ans.*

(35) $\frac{3}{5}\times\frac{7}{12}\times\frac{2}{1}\times\frac{7}{4}=\frac{147}{120}=\frac{49}{40}=1\frac{9}{40}$ *Ans.*

APPLICATION. (Arith. 90.)

(36) $\frac{5}{7}\div\frac{4}{19}=\frac{20}{133}=\$.15\frac{5}{133}$ *Ans.*

(37) $\frac{5}{8}\div\frac{23}{9}=\frac{115}{27}=\$4.25\ 9\frac{7}{27}$ *Ans.*

(38) $\frac{\cancel{8}}{117}\div\frac{51}{\cancel{8}}=\frac{51}{117}=\$.4\ 35\frac{105}{117}$ *Ans.*

(39) $\frac{2603}{9} \div \frac{1}{30} = \frac{2603}{270} =$ 9lb. 10oz.$\frac{34}{135}$ *Ans.*

(40) $\frac{591}{\cancel{8}} \div \frac{\overset{2}{\cancel{16}}}{405} = \frac{1182}{405} = \$2.91\frac{69}{81}$ *Ans.*

(41) $\frac{1}{7} \div \frac{8}{9} = \frac{8}{63} = \$.1269\frac{53}{63}$ *Ans.*

PROPORTION, OR SINGLE RULE OF THREE.

(Arith. 92.)

(2)

$$\begin{array}{l} \text{yds.}\quad \text{yds.}\qquad \$ \\ \text{As } 4 : 26 : : 8 \\ \qquad\ \ 8 \\ \hline 4)208 \\ \hline \ \$52 \textit{ Ans.} \end{array}$$

(3)

$$\begin{array}{l} \qquad \text{lbs.}\quad \text{lbs.}\qquad \$ \\ \text{As } 28 : 7 : : 5.88 \\ \qquad\qquad\qquad\quad 7 \\ \hline \qquad\qquad\quad\ \$ \\ 28)4116(1.47 \textit{ Ans.} \\ \quad\ \ 28 \\ \hline \quad\ \ 131 \\ \quad\ \ 112 \\ \hline \quad\ \ \ \ 196 \\ \quad\ \ \ \ 196 \\ \hline \end{array}$$

(4) First, as \$9 : \$243 : : 3yds.; then 243×3=729 ÷9=81yds. *Ans.*

(5) First, as 5lbs. : 30lbs. : : 45cts.; then 45×30= 1350÷5=\$2.70. *Ans.*

(6) First, as \$120 : \$30 : : 20yds.; then 30×20= 600÷120=5yds. *Ans.*

(7) First, as 56cts. : \$7.12 : : 7lbs.; then 712×7= 4984÷56=89lbs. *Ans.*

(8) First, as 3co. : 27co. : : $4.35 ; then 435×27= 11745÷3=$39.15. *Ans.*

(9) First, as $35.50 : $106.50 : : 4yds. ; then 10650 ×4=42600÷3550=12yds. *Ans.*

(10) First, as 12yds. : 192yds. : : $9.72 ; then 972× 192=186624÷12=$155.52. *Ans.*

(11) First, as $9 : $24 : : 6bus. ; then 24×6÷9= 16bus. *Ans.*

(12) First as 7lbs. : 25lbs. : : 63cts. ; then 63×25= 1575÷7=$2.25. *Ans.*

(13) First as $14.10 : $37.60 : : 3ca. ; then 3760× 3=11280÷1410=8 calves. *Ans.*

(14) First, as 28lbs. : 3lbs. : : $4.20 ; then 420×3÷ 28=45cts. *Ans.*

(15) First, as $5.25 : $15.00 : : 21lbs. ; then 1500× 21÷525=60lbs. *Ans.*

(16) First, as 11gal. : 25gal. : : $3.74 ; then 374× 25=9350÷11=$8.50. *Ans.*

(17) First, as $5.00 : $18.75 : : 4lam. ; then 1875× 4÷500=15 lambs. *Ans.*

(18) First, as 13lbs. : 196lbs. : : 715m. ; then 196× 715=140140÷13=$10.78. *Ans.*

(19) First, as 3ho. : 5ho. : : 15mi. ; then 15×5÷3 =25 miles. *Ans.*

(20) First, as $592 : $962 : : 8ox. ; then 962×8÷ 592=13 oxen. *Ans.*

(21) First, as 8m. : 12m. : : 30da. ; then 30×12÷8 =45 men. *Ans.*

(22) First, as 15da. : 24da. : : 5m. ; then 24×5÷15 =8 men. *Ans.*

(23) First, as 12ho. : 8ho. : : 6da. ; then 8×6÷12= 4 days. *Ans.*

(24) First, as \$450 : \$100 : : 180da.; then 180×100 ÷450=40 days. *Ans.*

(25) First, as 5m. : 13m. : : 35da.; then 35×13÷5 =91 days. *Ans.*

(26) First, as 4da. : 16da. : : 7m.; then 16×7÷4= 28 men. *Ans.*

(27) First, as 20hor. : 8hor. : : 35bus.; then 35×8 ÷20=14bus. *Ans.*

(28) First, as 8m. : 20m. : : 34da.; then 34×20÷8 =85 men. *Ans.*

(29) First, as 5m. 8m. : : 20da.; then 20×8÷5=32 days. *Ans.*

(30) First, as 7da. : 35da. : : 20m.; then 35×20÷7 =100 men. *Ans.*

(31) First, as 12ox. : 36ox. : : 5ac.; then 36×5÷12 =15 acres. *Ans.*

(32) First, as \$80 : \$300 : : 36da.; then 36×300÷ 80=135 days. *Ans.*

(33) First, as 9ho. : 8ho. : : 45da.; then 45×8÷9= 40 days. *Ans.*

(34) First, as 120sh. : 300 : : 14da.; then 14×300÷ 120=35 days. *Ans.*

(35) First, as 70da. : 40da. : : \$280; then 280×40 ÷70=\$160. *Ans.*

(36) First, as 24in. : 32in. : : 84yds.; then 84×32= 2688÷24=112 yards. *Ans.*

(37) First, as 1yd. : 20yds. : : \$3.125; then 3125× 20=\$62.50. *Ans.*

(38) First, as 1bus. : 24bus. : : 59cts.; then 59×24 =14.16. *Ans.*

(39) First, as 56lbs. : 1lb. : : \$9.25; then 925÷56= 16cts. 5m.$\frac{5}{28}$. *Ans.*

(40) First, 36oz. 10dwt.=730dwts. ; 1oz.=20dwt. ; then as 730dwt. : 20dwt. : : \$24.33 ; now 2433 ×20÷730=\$0.666$\frac{42}{73}$. *Ans.*

(41) First, as 103gal. : 1gal. : : \$43.98 ; then 4398 ÷103=426$\frac{102}{103}$. *Ans.*

(42) First, as 1ac. or 160per. : 50 2 20 or 8100per. : : \$18.25 ; then 1825×8100=14782500÷160= \$923.90$\frac{5}{8}$. *Ans.*

(43) First, as 1yd. : 12×12=144 : : \$1.40 ; then 144×140=\$201.60. *Ans.*

(44) First, as 365da. : 1da. : : \$300 ; then 30000÷ 365=\$0.82$\frac{14}{73}$. *Ans.*

(45) First, as 1da. : 365da. : : 7d.; then 365×7= 2555÷12=212s. 11d.÷20=£10 12s. 11d. *Ans.*

(46) First, as 3$\frac{1}{2}$lbs. or 7 half-pounds : 100lbs. or 200 half-pounds : : 24cts. ; then 24×200÷7=\$6.857$\frac{1}{7}$. *Ans.*

(47) First, as 17cwt. 3qr. 17lbs. : 1oz. : : \$286.72 ; now 17cwt. 3qr.17lbs.=1792lbs.×16=28672oz.; then 28672÷28672=1ct. *Ans.*

(48) First, as 1bus. : 1475bus. : : 87$\frac{1}{2}$cts. ; then 1475 ×87$\frac{1}{2}$=\$1290.62$\frac{1}{2}$. *Ans.*

(49) First, as 1lb. : 10cwt. 2qrs. or 1050lb. : : 1$\frac{1}{2}$; then 1050×1$\frac{1}{2}$=\$15.75. *Ans.*

(50) First, as 1pt. : 3hog.=1512pts. : : 10cts. ; then 1512×10=\$151.20. *Ans.*

(51) First, as 1pipe=1008pts. : 1pt. : : \$115.000 ; then 115000÷1008=\$0.114$\frac{88}{1008}$. *Ans.*

(52) First, as 1yd. : 5pie.×25yds.=125yds. : : \$2.25 ; then 2.25×125=\$281.25. *Ans.*

(53) First, as 1ac. : 225ac. : : \$43.75 then 43.75× 225=\$9843.75. *Ans.*

(54) First,as 1oz.=20dwt.: 1lb. 7oz. 14dwt.=394 dwt. : : 79cts.; then 394×79=31120÷20=$\$15.56\frac{3}{10}$.

(55) First, as 9lb. 9oz. 12dwt.=56448 grains: 1gr. : : \$1027.28; then, 102728÷56448=$\$0.01\ 8\frac{11216}{56448}$

(56) First, as 1yd.=4qr.: $27\frac{1}{4}$yd.=109qr. : : 6s. $9\frac{1}{2}$d. =326far.; then 326×109=35534÷4=8883far. ÷4÷12÷20=£9 5s. $0\frac{3}{4}$d.+ *Ans.*

(57) As 1yd.: 327yds. : : 19cts.: \$62.13. *Ans.*

(58) First, as 24bus.: 1bus. : : \$11.16; then 1116÷24=\$0.46 5. *Ans.*

(59) As 12days: 1da. : : \$7.50: $\$0.62\frac{1}{2}$. *Ans.*

(60) As 63gal.: 1gal. : : \$42.00: $\$0.66\ 6\frac{42}{63}$. *Ans.*

(61) First, as 1lb.: 100lb. : : $9\frac{1}{2}$cts.; then 100×$9\frac{1}{2}$= \$9.50. *Ans.*

(62) First, as 1lb.: 128lb. : : \$0.38 7; then 128×387 =\$49.53 6. *Ans.*

(63) As 30da.: 1da. : : \$25: $\$0.83\ 3\frac{1}{3}$. *Ans.*

(64) As 1t.=1008qts.: 1qt. : : \$150.000: $\$0.14\ 8\frac{816}{1008}$.

(65) As 1yd. : 12pie.×35yds.=420yds. : : \$2.18: \$915.60. *Ans.*

(66) As \$0.75: \$16.50 : : 1yd. : 22yds. *Ans.*

(67) First, as 16w.: 52w. : : \$47.09; then 4709×52 =244868÷16=$\$153.04\frac{1}{4}$. *Ans.*

(68) First, as 1ac.=160per.: 125a. 2r. 27p.=20147p. : : \$32.50; then 20147×3250=65477750÷160 =$\$4092.35\frac{15}{16}$. *Ans.*

(69) As 57cts.: \$125.00 : : 1gal.: 219gal. $1\frac{11}{57}$qt.

(70) First, 365da. ×$9\frac{1}{2}$cts.=\$34.675; then 1per.: 11per. : : \$34.675: \$381.425. *Ans.*

(71) First, as 3ca.: 25ca. : : $4\frac{1}{2}$tons; then 25×$4\frac{1}{2}$= $112\frac{1}{2}$÷3=$37\frac{3}{6}$ or $\frac{1}{2}$. *Ans.*

(72) As \$1.11: \$51.06 : : 1sheep: 46sheep. *Ans.*

(73) First, $890.15−120=$770.15; then as 365da.: 1da. : : $770.15; now $770.15÷365=$2.11.

(74) First, as 1da.: 365da.: : $2.14: $781.10 spends in one year; then $1333−$781.10=$551.90.

(75) First, 120$\frac{1}{2}$+124+126$\frac{3}{4}$=371$\frac{1}{4}$gal.; then as 1gal.=4qts.: 371$\frac{1}{4}$gal.=1485qts.: : 68$\frac{1}{2}$cts.; now 1485×68$\frac{1}{2}$=101722$\frac{1}{2}$÷4=254.30\frac{5}{8}$. *Ans.*

(76) First, 8×4=32par.×10=320pie.×26 = 8320 yds.; then as 6yds.: 8320yds.: : £4 16s.=96s.; now 8320×95= 798720 ÷ 6 = 133120 ÷ 20= £6656.

(77) First, 64ox. × $50 = $3200+$20+$33.33 + $26.67+$50+$654=$3984; then as 64ox.: 27ox.: : $3984; now 3984×27=107568÷64= $1680.75. *Ans.*

(78) First, as 2cwt. 1qr. 14lbs.=239lbs. : 1lb. : : $85.75+$15=$100.75; then $100.75÷239 = 0.42\frac{37}{239}$. *Ans.*

(79) First, as 200yds.: 1yd. : : $173.15−$15.87$\frac{1}{2}$= $157 27$\frac{1}{2}$; then 157.27\frac{1}{2}$÷200=$0.78 6$\frac{3}{8}$. *Ans.*

(80) First, $1273+$94.13+$15+$25.75+$18+ $360=$1785.88; then as 92pipes : 1pipe: : $1785.88; now 1785.85÷92=$19.41$\frac{16}{92}$.=$\frac{4}{23}$.

(81) First, 365−52=313da.; now as 1da.: 313da. : : $3.49; then 313×349=$1092.37 spends on week-days; again as 1da.: 52da.: : $2.50: $130 spends on first-days or Sundays; now $1092.37 +$130=$1222.37 and $1927−$1222.37= $704.63. *Ans.*

(82) First, 365da.×25yrs.=9125da.×this by 1$\frac{1}{2}$ because he drinks one and a half gills each day =13687$\frac{1}{2}$gills which ÷8=1710qts. 7$\frac{1}{2}$gills÷4= 427gals. 2qts.÷63=6hhd. 49gal. 2qts. 7$\frac{1}{2}$gills, first answer: then 9125da.×3glasses=27375gla. ×3cts.=82125cts. the value of the liquor; now $15 : $821.25 : : 1ac.: 54acres, 3roods. *Ans.*

(83) First, 100hogs×274=27400lbs.÷8=3425−27400=23975lbs. of pork÷200lbs. the number of pounds in one barrel of pork=119bbls. first answer and 175lbs. over: now 119bbls.×$$15\frac{3}{4}$ =$1874.25, value of the bbls. of pork: again 3425 the one eighth of the pounds of pork+175 lbs. what was over=3600lbs.; then say as 1lb.: 3600lbs. : : $5\frac{1}{2}$cts. : $198, the value of the lard, heads, feet, and odd pounds of pork: now $1874.25+$198=$2072.25. *Ans.*

(84) First, 56−21=35yrs.; then 365−52=313da. ×35=10955 days or hours×8cts.=$876.40. *Ans.* Again 10955ho.÷24÷365=1yr. 91da. 11ho. *Ans.*

(85) As 2ft. 6in.=30in. : 20ft.=240in. : : 27ft. : 216ft. ÷3=72yds. *Ans.*

(86) As 3qrs. : $1\frac{3}{4}$ yds.=7qrs. : : $7\frac{1}{2}$yds. : $17\frac{1}{2}$. *Ans.*

(87) As 15po. : 40po. : : 4 : 10po. 3yds. 2ft. *Ans.*

(88) As 3qrs. : 2yds.=8qrs. : : $5\frac{1}{2}$yds. : $14\frac{2}{3}$yds. *Ans.*

(89) As 8po. : 1po. : : 160po. : 20po. *Ans.*

(90) As $6\frac{1}{2}$in.=13half-in. : 9in.=18half-in. : : 40bds. : $55\frac{5}{13}$bds. *Ans.*

(91) As 3qrs. : 5yds.=20qrs. : : 6yds. : 40yds. *Ans.*

(92) As 3qrs. : 18ft.÷3×4=24qrs. : : 60ft. : 480÷3 =160yds. *Ans.*

(93) As 39in.=156qrs. : 3qrs. : : 208lb. : 4lb. *Ans.*

(94) As $4\frac{1}{2}$in.=9half-in. : 12in.=24half-in. : : 12in. : 32in. *Ans.*

(95) As 3qrs. : 15ho.=60qrs. : : 1pi. : 20pi. *Ans.*

(96) As 7ft shade : 193ft. shade : : 4ft. length : 113+ ft. *Ans.*

(97) As 7ft. : 190ft. : : 5ft. : $135\frac{5}{7}$ft. *Ans.*

(98) As 5ft. 9in.=69in. : 175ft.=2100in. : : 7ft. : $213\frac{3}{69}$ft. *Ans.*

(99) As $1.24 5 : $0.83 0 : : 9oz. : 6oz. *Ans.*

(100) As 16oz. : 12oz. : : $1.25 : $\$0.93\frac{3}{4}$. *Ans.*

(101) First, as 3ap. : 21ap. : : 1ct. : 7cts. the value of 21 apples. Again, as 12pears : 84pears : : 7cts.: 49cts. *Ans.*

(102) First, $15+$13+$8.75+$3.25=$80, the cost of one of each kind ; then as $80 : $1040 : : 1 of each : 13 of each kind. *Ans.*

(103) As 6da. 4ho.=76ho. : 1ho. : : 285mi. : 3mi. 6fur. *Ans.*

(104) As 3cwt. 1qr.=325lb. : 5cwt. 0qrs. 14lbs.=514 lb. : : 96mi. : $151\frac{269}{325}$mi.

(105) As 4ho. : 9da. 8ho. : : 12mi. : 348mi. *Ans.*

(106) As 21cows : 6cows : : 91days : 26days. *Ans.*

(107) As the stones 2ft. long : 3ft. long : : 6352 stones : 9528stones. *Ans.*

(108) First, 102gal.+163gal. + 142gal.=407gals. whole quantity ; then 407gal.×34cts.=$138.38 whole gain+$712.25=$850 63; now as 407gal.: 1gal. : : $850.63 : $2.09. *Ans.*

(109) First 50gal.—35=15gal. left in each hour ; then as 15gal. : 230gals. : : 1hour : $15\frac{1}{3}$ho. *Ans.*

(110) First one guinea=$4.66 7×109guin.=$508.703 ; now £45×20÷6=$150 ; then $508.70 3—$150=$358.70 3 to be spent. Again, as 365da.: 1da. : : $358.70 3 : $\$0.98\,2\frac{273}{365}$. *Ans.*

(111) First, 3hhds.=6048gills ; then as 21men : 1m. : : 6048gills : 288gills that each man has for 12 days : again, as 12da. : 1da. : : 288g. : 24g. *Ans.*

(112) First, as 1sec. : 1m. 3sec.=63sec. : : 1150ft. ; now 1150×63=72450ft.÷3=24150yds.÷ 220 =109 fur. 170po.÷8=13mi. 5fur. 170po. *Ans.*

(113) As 1sec. : 26sec. : : 1150ft. : 29900ft.÷3÷220 ÷8=5mi. 5fur. 66yds. : 2ft. *Ans.*

(114) First, one guinea=$4.66 7×500=2333.50= income a year; then, £107 10s.=2150s÷8s. or 1 dollar=$268.75 house-rent; again 1yr. =52w.×$$7\frac{1}{2}$=$390board; now $268.75+$390 =$658.75 the rent and board, which subtracted from the income $2333.50=$1674.75 for other expenses; then make the statement by saying as 365da. : 1da. : : $1674.75 : $4.58 $8\frac{130}{365}$. *Ans.*

(115) As 1gal. : 18pi.=2268gals. : : 12s. 6d.=150d.; then 2268×150=34020÷by 7s. 6d. or 90d.= $3780. *Ans.*

(116) First, as 18lb. : 27cwt. 3qr. 15lb.=2790lb. : : 19s. 6d.=234d.; now 2790×234=652860÷18 =36270d.÷72 the pence in a dollar=$$503\frac{54}{72}$ or $\frac{3}{4}$. *Ans.*

(117) As 1hhd. : 8pi. or 16hhds. : : £87 13s. 6d.= 21042d.×16=336672÷96d. or $1.=$3507.

(118) As 1oz.=480gr. : 15lb. 11oz. 13dwt. 17gr.= 92009gr. : : 12s. 7d.=151d.; now 92009×151= 13893359÷480=$28944\frac{239}{480}$÷96=$301\frac{48}{96}=\frac{1}{2}$.

(119) As he spends as much in 4 months as he gains in 3 months he will spend in 8 months, what he gains in 6 months; then, as 8mo. : 12mo. : : $428.50 : $642.75 spends a year and $428.50× 2=$857 gains a year; now $857—$642.75= $214.25. *Ans.*

(120) As 7mo. : 3mo. : : $428.56 : $183.64 the gain in three months, which sum he spends in 5 months; then $183.64×4=$734.56 the gain a year; again, as 5mo. : 12mo. : : $183.64 : $440.73 what he spends in a year; now $734.50— $440.73=$293.83. *Ans.*

(121) First, 184pie.×$28\frac{1}{2}$yds.=5244yds. of the former; now 19yds. : 14 : : 5244yds. : 3864yds.

(122) First bring $2146 to half-pence by multiplying by 54 pence in one dollar sterling and by 2= 231768 half-pence; then as 5s. 8$\frac{1}{2}$d.=137half-pence : 231768half-pence : : 1yd. : 1691yds. 2qr. 3$\frac{109}{137}$na. *Ans.*

COMPOUND PROPORTION. (Arith 101.)

(2)

$$\left.\begin{array}{ll}\text{men} & 4:\ 8\\ \text{days} & 12:16\end{array}\right\}::48\text{ acres}$$

Canceled—

$$\frac{\overset{4}{\cancel{48}}\times\overset{\cancel{2}}{\cancel{8}}\times16}{\cancel{12}\quad\cancel{4}}$$ then 16×2×4=128 acres. *Ans.*

(3)

$$\left.\begin{array}{ll}\text{horses} & 18:60\\ \text{days} & 20:36\end{array}\right\}::10\text{ bus.}$$

$$\frac{\overset{3}{\cancel{60}}\times\overset{2}{\cancel{36}}\times10}{\cancel{20}\times\cancel{18}}$$ then 10×2×3=60bus. *Ans.*

(4)

$$\left.\begin{array}{ll}\text{men} & 20:\ 8\\ \$ & \ \ 4:40\end{array}\right\}::3\text{da.}$$

$$\frac{\overset{2}{\cancel{8}}\times\overset{2}{\cancel{40}}\times3}{\cancel{4}\times\cancel{20}}$$; then 3×2×2=12 days. *Ans.*

(5)

$$\left.\begin{array}{ll}\text{pounds} & 84:36\\ \text{days} & \ \ 4:\ 6\end{array}\right\}::14\text{ men}$$

$$\frac{\overset{9}{\cancel{36}}\times\cancel{6}\times\cancel{14}}{\cancel{84}\times\cancel{4}}=9\text{ men.}$$ *Ans.*

(7)

(6)

$$\left.\begin{array}{lrr} \text{men} & 20: & 12 \\ \text{long} & 25: & 150 \\ \text{high} & 7: & 8 \\ \text{thick} & 4: & 3 \end{array}\right\} :: 18 \text{ days} \qquad \frac{\overset{3}{\cancel{12}}\times\overset{6}{\cancel{150}}\times\overset{2}{\cancel{8}}\times3\times18}{\cancel{20}\times\underset{5}{\cancel{25}}\times7\times\cancel{4}}$$

$$\text{then } \frac{3\times6\times2\times3\times18}{5\times7}=\frac{1944}{35}=55\tfrac{19}{35} \text{ Ans}$$

(7)

$$\left.\begin{array}{lrr} \text{boys} & 3: & 60 \\ \text{qrs.} & 2: & 18 \end{array}\right\} :: \$40.20$$

$$\frac{60\times\overset{3}{\cancel{18}}\times40{,}20}{\cancel{3}\times\cancel{2}} \qquad 60\times3\times40.20=\$7236 \text{ Ans.}$$

(8)

$$\left.\begin{array}{lrr} \$ & 100: & 75 \\ \text{mo.} & 12: & 9 \end{array}\right\} :: \$6$$

$$\frac{\overset{3}{\cancel{75}}\times9\times\cancel{6}}{\underset{4}{\cancel{100}}\times\underset{2}{\cancel{12}}}=\frac{27}{8}=\$3.375 \quad \text{Ans.}$$

(9)

$$\left.\begin{array}{llrr} \text{princ.} & \$ & 750: & 100 \\ \text{ints.} & \$ & 8: & 480 \end{array}\right\} :: 12\text{mo. or } 1\text{yr. Ans.}$$

$$\frac{\overset{2}{100}\times\overset{\overset{4}{\cancel{60}}}{\cancel{480}}\times1}{\underset{\cancel{15}}{\cancel{750}}\times\cancel{8}} \qquad \text{then } 4\times2=8\text{yrs. Ans.}$$

(10)

$$\left.\begin{array}{lrcr}\text{hours} & 9 & : & 12\\ \text{men} & 24 & : & 216\\ \text{long} & 240 & : & 420\\ \text{wide} & 5 & : & 6\\ \text{deep} & 2 & : & 3\end{array}\right\} :: 5 \text{ days}$$

$$\frac{\cancel{12}\times\overset{27}{\cancel{216}}\times\overset{7}{\cancel{420}}\times\overset{\cancel{2}}{\cancel{6}}\times\cancel{3}\times\cancel{5}}{\underset{\cancel{3}}{\cancel{9}}\times\underset{\cancel{2}}{\cancel{24}}\times\underset{\cancel{4}}{\cancel{240}}\times\cancel{5}\times\cancel{2}}$$

then 27×7=189 da. *Ans.*

(11)

$$\left.\begin{array}{lrcr}\text{bbls.} & 44 & : & 36\\ \text{miles} & 108 & : & 192\end{array}\right\} :: \$154$$

$$\frac{\overset{\cancel{4}}{\cancel{36}}\times\overset{16}{\cancel{192}}\times\overset{14}{\cancel{154}}}{\underset{\cancel{12}}{\cancel{108}}\times\underset{\cancel{11}}{\cancel{44}}}$$

then 16×14=$224 *Ans.*

(12)

$$\left.\begin{array}{lrcr}\text{hours} & 16 & : & 12\\ \text{miles} & 240 & : & 720\end{array}\right\} :: 12 \text{ days}$$

$$\frac{\overset{3}{\cancel{12}}\times\overset{3}{\cancel{720}}\times\overset{3}{\cancel{12}}}{\underset{\cancel{4}}{\cancel{16}}\times\cancel{240}}$$

3×3×3=27 days. *Ans.*

(13)

ma. ap.

$$\begin{array}{rl} 3\times8+3 & =27 \text{ persons} \\ 5\times6 & =30 \text{ days} \\ 5\times10+5 & =55 \text{ persons} \\ 8\times5\tfrac{1}{2} & =44 \text{ days} \end{array} \qquad \begin{array}{l} \text{per.} \\ \text{days} \end{array} \left.\begin{array}{r} 27:55 \\ 30:44 \end{array}\right\} :: \$360$$

$$\frac{55\times44\times\overset{\overset{4}{\cancel{12}}}{\cancel{360}}}{\underset{9}{\cancel{27}}\times\cancel{30}}$$

$$\text{then } \frac{55\times44\times4}{9}=\frac{9680}{9}=\$1075.55+ \textit{ Ans.}$$

(14)

$$\begin{array}{l} \text{men} \\ \text{feet} \\ \text{feet} \end{array} \left.\begin{array}{r} 68:145 \\ 32:\ \ 28 \\ 40:\ \ 36 \end{array}\right\} :: 8 \text{ days}$$

$$\frac{\overset{29}{\cancel{145}}\times\overset{7}{\cancel{28}}\times\overset{9}{\cancel{36}}\times\cancel{8}}{68\times\underset{\cancel{4}}{\cancel{32}}\times\underset{\underset{2}{\cancel{8}}}{\cancel{40}}}$$

$$\frac{29\times7\times9}{68\times2}=\frac{1827}{136}=13\text{da. } 10\tfrac{7}{17}\text{ho. } \textit{Ans.}$$

(15)

$$\begin{array}{l} \text{acres} \\ \text{hours} \end{array} \left.\begin{array}{r} 45:108 \\ 15:\ \ \ 9 \end{array}\right\} :: 12\text{in.}$$

$$\frac{108\times\cancel{9}\times\overset{4}{\cancel{12}}}{\underset{5}{\cancel{15}}\times\underset{5}{\cancel{45}}}=\frac{432}{25}=17\tfrac{7}{25} \textit{ Ans.}$$

(16)

$$\left.\begin{array}{lrr} \text{men} & 15 : & 8 \\ \text{long} & 24 : & 175 \\ \text{high} & 14 : & 8 \\ \text{wide} & 4 : & 6 \end{array}\right\} : : 18 \text{ days}$$

$$\frac{\overset{2}{\cancel{8}}\times\overset{\overset{5}{\cancel{35}}}{\cancel{175}}\times\overset{2}{\cancel{8}}\times\overset{3}{\cancel{6}}\times\overset{\overset{2}{\cancel{6}}}{\cancel{18}}}{\underset{\cancel{3}}{\cancel{15}}\times\underset{\cancel{3}}{\cancel{24}}\times\underset{\cancel{7}}{\cancel{14}}\times\cancel{4}}$$

then 5×2×3×2=60 *Ans.*

(17)

$$\left.\begin{array}{lrr} \text{long} & 36 : & 240 \\ \text{wide} & 7 : & 9 \\ \text{deep} & 8 : & 5 \\ \text{days} & 10 : & 16 \end{array}\right\} : : 14 \text{ men} \qquad \frac{\overset{\cancel{20}}{\cancel{240}}\times\overset{3}{\cancel{9}}\times 5\times\overset{2}{\cancel{14}}\times\overset{2}{\cancel{16}}}{\underset{\cancel{3}}{\cancel{36}}\times\cancel{7}\times\cancel{8}\times\cancel{10}}$$

then 2×3×5×2×2=120 men. *Ans.*

(18)

$$\left.\begin{array}{lrr} \text{half yds.} & 5 : & 280 \\ \text{qrs.} & 6 : & 4 \end{array}\right\} : : 12\text{oz.}$$

$$\frac{280\times\cancel{4}\times\overset{\cancel{2}}{\cancel{12}}}{\cancel{6}\times 5\times\underset{\underset{2}{\cancel{8}}}{\cancel{16}}\text{oz.}}=\frac{280}{10}=28 \textit{ Ans.}$$

(19)

$$\left.\begin{array}{rr} 8 : & 96 \\ 5 : & 3 \end{array}\right\} : : \$25$$

$$\frac{\overset{12}{\cancel{96}}\times 3\times\overset{5}{\cancel{25}}}{\cancel{5}\times\cancel{8}}$$

now 12×3×5=$180 *Ans.*

(20)

$$\left.\begin{array}{l}\$.0450 : \$.1875 \\ \$1.625 : \$1.250\end{array}\right\} :: 6\text{oz.}$$

$$\frac{.1875\times1.250\times6}{.0450\times1.625}=\frac{14062500}{731250}=19\frac{168750}{731250}=\frac{3}{13}\ \textit{Ans.}$$

PRACTICE. (Arith. 104.)

Case I.

(3)

cts.		
25	$\frac{1}{4}$	7945.00
		$1986.25 *Ans.*

(4)

25	$\frac{1}{4}$	8536
12½	$\frac{1}{2}$	2134
		1067
		$3201 *Ans.*

(5)

50	$\frac{1}{2}$	4263
25	$\frac{1}{2}$	2131.50
		1065.75
		$3197.25 *Ans.*

(6)

12½	$\frac{1}{8}$	5130
		$641.25 *Ans.*

(7)

cts.		
50	$\frac{1}{2}$	6321
25	$\frac{1}{2}$	3160.50
12½	$\frac{1}{2}$	1580.25
		790.12½
		$5530.87½ *Ans.*

(8)

12½	$\frac{1}{8}$	4964
6¼	$\frac{1}{2}$	620.50
		310.25
		$930.75 *Ans.*

(9)

50	$\frac{1}{2}$	5425
12½	$\frac{1}{4}$	2712.50
		678.12½
		$3390.62½ *Ans.*

cts.		(10)
25	$\frac{1}{4}$	3840
$6\frac{1}{4}$	$\frac{1}{4}$	960
		240
		$1200 *Ans.*

cts.		(11)
50	$\frac{1}{2}$	5439
10	$\frac{1}{5}$	2719.50
5	$\frac{1}{2}$	543.90
		271.95
		$3535.35 *Ans.*

Case ii. (Arith. 105.)

d.		(13)
1	$\frac{1}{12}$	4517 at 1d.
	2[0	37[6 5
		£18 16 5 *Ans.*

		(14)
2	$\frac{1}{6}$	5463 at 2d.
	2[0	91[0 6
		£45 10 6 *Ans.*

		(15)
3	$\frac{1}{4}$	6128 at 3d.
	2[0	153[2
		£76 12 *Ans.*

d.		(16)
4	$\frac{1}{3}$	5132 at 4d.
	2[0	171[0 8
		£85 10 8 *Ans.*

		(17)
4	$\frac{1}{3}$	7148 at 5d.
1	$\frac{1}{4}$	2382 8
		595 8
	2[0	297[8 4
		£148 18 4 *Ans.*

		(18)
6	$\frac{1}{2}$	2137 at 6d.
	2[0	106[8 6
		£53 8 6 *Ans.*

d.		(19)
6	$\frac{1}{2}$	1426 at 7d.
1	$\frac{1}{6}$	713
		118 10
	2[0	83[1 10
		£41 11 10 *Ans.*

		(20)
6	$\frac{1}{2}$	1839 at 8d.
2	$\frac{1}{3}$	919 6
		306 6
	2[0	122[6 0
		£61 6 *Ans.*

		(21)
6	$\frac{1}{2}$	2754 at 9d.
3	$\frac{1}{2}$	1377
		688 6
	2[0	206[5 6
		£103 5 6 *Ans.*

d.		(22)
6	$\frac{1}{2}$	1683 at 10d.
4	$\frac{1}{3}$	841 6
		561 0
	2[0	140[2 6
		£70 2 6 *Ans.*

		(23)
6	$\frac{1}{2}$	3814 at 11d.
4	$\frac{1}{3}$	1907
1	$\frac{1}{4}$	1271 4
		317 10
	2[0	349[6 2
		£174 16 2 *Ans.*

		(25)
2	$\frac{1}{6}$	1861 at 2d.
	2[0	31[0 2
		£15 10 2 *Ans.*

(26)

d.		
3	¼	2147 at 3½d.
½	⅙	536 9 89 5½
	2[0	62[6 2½
		£31 6 2½ *Ans.*

(27)

3	¼	7000 at 3¾d.
½ ¼	⅙ ½	1750 291 8 145 10
	2[0	218[7 6
		£109 7 6 *Ans.*

(28)

4	⅓	3257 at 4d.
	2[0	108[5 8
		£54 5 8 *Ans.*

(29)

d.		
3	¼	2456 at 4¼
1 ¼	⅓ ¼	614 204 8 51 2
	2[0	86[9 10
		£43 9 10 *Ans.*

(30)

4	⅓	3210 at 5d.
1	¼	1070 267 6
	2[0	133[7 6
		£66 17 6

(31)

4	⅓	7521 at 5¾d.
1½ ¼	⅛ ⅙	2507 940 1½ 156 8¼
	2[0	360[3 9¾
		£180 3 9¾ *Ans.*

(32)

d.		
4	$\frac{1}{3}$	7610 at 6$\frac{1}{4}$
2	$\frac{1}{2}$	2536 8
$\frac{1}{4}$	$\frac{1}{8}$	1268 4
		158 6$\frac{1}{2}$
	2[0	396[3 6$\frac{1}{2}$
		£198 3 6$\frac{1}{2}$ *Ans.*

(33)

6	$\frac{1}{2}$	3271 at 7d.
1	$\frac{1}{6}$	1635 6
		272 7
	2[0	190[8 1
		£95 8 1 *Ans.*

(34)

6	$\frac{1}{2}$	3714 at 7$\frac{3}{4}$d.
1$\frac{1}{2}$	$\frac{1}{4}$	1857
$\frac{1}{4}$	$\frac{1}{6}$	464 3
		77 4$\frac{1}{2}$
	2[0	239[8 7$\frac{1}{2}$
		£119 18 7$\frac{1}{2}$ *Ans.*

(35)

d.		
6	$\frac{1}{2}$	2759 at 8$\frac{1}{2}$d.
2	$\frac{1}{3}$	1379 6
$\frac{1}{2}$	$\frac{1}{4}$	459 10
		114 11$\frac{1}{2}$
	2[0	195[4 3$\frac{1}{2}$
		£97 14 3$\frac{1}{2}$ *Ans.*

(36)

6	$\frac{1}{2}$	5272 at 9d.
3	$\frac{1}{2}$	2636
		1318
	2[0	395[4
		£197 14 *Ans.*

(37)

6	$\frac{1}{2}$	6325 at 9$\frac{1}{4}$d.
3	$\frac{1}{2}$	3162 6
$\frac{1}{4}$	$\frac{1}{12}$	1581 3
		131 9$\frac{1}{4}$
	2[0	487[5 6$\frac{1}{4}$
		£243 15 6$\frac{1}{4}$ *Ans.*

(38)

d.		
6	½	3254 at 10½
4	⅓	1627
½	⅛	1084 8
		135 7
	2[0	284[7 3
		£142 7 3 *Ans.*

(39)

6	½	3256 at 11d.
4	⅓	1628
1	¼	1085 4
		271 4
	2[0	298[4 8
		£149 4 8 *Ans.*

(40)

d.		
6	½	7972 at 11¾
4	⅓	3986
1	¼	2657 4
½	½	664 4
¼	½	332 2
		166 1
	2[0	780[5 11
		£390 5 11 *Ans.*

APPLICATION. (Arith. 106.)

(41)

cts.		
50	½	246 at 87½cts.
25	½	123
12½	½	61.50
		30.75
		$215.25 *Ans.*

(42)

cts.		
6¼	1/16	600 at 6¼cts.
		$37.50 *Ans.*

(43)

cts.		
½	½	54 at 6¾cts.
		6¾
¼	½	27 at ½ct.
		13 5 at ¼ct.
		324 at 6cts.
		$3.64 5 *Ans.*

(44)

12½	⅛	2154 at 12½cts.
		$269.25

(45)

50	½	437 at 62½cts.
12½	¼	218.50
		54.62½
		$273.12½ *Ans.*

(46)

12½	⅛	28 at 18¾cts.
6¼	½	3.50
		1.75
		$5.25 *Ans.*

(47)

cts.		
25	¼	279 at 31¼cts.
6¼	¼	69.75
		17.43¾
		$87.18¾ *Ans.*

(48)

2)3.50
27½

175
2450
700

$96.25 *Ans.*

(49)

d.		
3	¼	120 at 3d.
2[0		3[0
		£1 10 *Ans.*

(50)

2	⅙	8012 at 2¾
½	¼	1335 4
¼	½	333 10
		166 11
2[0		183[6 1
		£91 16 1 *Ans*

```
d.             (51)          |  d              (52)
 6 | ½ | 3906 at 7½          |  6 | ½ | 1234 at 1s,11¾d.
   |   | ---------           |  4 | ⅓ |
1½ | ¼ | 1953                |    |   |   617
   |   |  488  3             |  1 | ¼ |   411  4
   |   | -------             |  ½ | ½ |    102  10
  2[0  | 244[1  3            |  ¼ | ½ |     51  5
   |   | ----------          |    |   |     25  8½
   |   | £122  1  3 Ans.     |    |   |  ----------
   |   | ----------          |   2[0  |  244[2  3½
                             |    |   |  ----------
                             |    |   |  £122  2  3½ Ans.
                             |    |   |  ----------
```

INTEREST. (Arith. 110.)

```
    (4)               (5)               (6)
   $756              $354              $525
      7                 7                 6
  ---------         --------          --------
  $52.92 Ans.       $24.78 Ans.       $31.50 Ans.
  ---------         --------          --------

     (7)               (8)                (9)
   $341.15           $527.14           $364.237
         6                 7                  7
   ---------         ---------         ----------
  $20.4690 Ans.     $36.8998 Ans.     $25.49659 Ans.
   ---------         ---------         ----------

     (10)               (11)              (12)
  $1354.093          $375.748            $493
          7                 5               7
  ----------         ---------          -------
  $94.78651 Ans.     $18.78740 Ans.     $34.51 Ans.
  ----------         ---------          -------
```

(13)
$266
7
$18.62 *Ans.*

(14)
$593.16
6
$35.5896 *Ans.*

(15)
$923.145
6
$55.38870 *Ans.*

(16)
$421.357
5
$21.06785 *Ans.*

(17)
$529.08
7
$37.0356 *Ans.*

(18)
$413.135
6
$24.78810 *Ans*

(19)
$1227.009
5
$61.35045 *Ans.*

(20)
$83.14
7
$5.8198 *Ans.*

(21)
$159.068
6
$9.54408 *Ans*

(22)
¼)$478.34
6¼
11958
287004
$29.8962 *Ans.*

(23)
½)$216.62
5½
10831
108310
$11.9141 *Ans.*

(24)
½)$428
6¾
½)214
107
2568
$28.89 *Ans*

(25)
$625143
7⅘
2)2500572
500114
4376001
$48.76115 *Ans.*

(26)
$42.16
7½
2108
29512
$3.1620 *Ans.*

(27)
½)$105.082
6¾
52541
26270
630492
$7.09303 *Ans*

(28)
$924.165
7¼
231041
6469155
$67.00196 *Ans.*

(29)
$220
5 5/7
7)1100
157
1100
$12.57 *Ans.*

(30)
$273.15
7
191205
27315
$292.27 *Ans.*

(31)
$426.284
6½
213142
2557704
2770846
426284
$453.992 *Ans.*

(32)
$295.14
5
147570
29514
$309.8970 *Ans.*

(33)
$173.71
7
121597
17371
$185.8697 *Ans*

(34)
$48.09
5½
2404
24045
26449
4809
$50.7349

(35)
$5146.37
6¾
257318
128659
3087822
514637
$5493.7499 *Ans.*

(37)
$538
7
37.66
3
$112.98 *Ans.*

(38)
$76.81
5
38405
2
$7.6810 *Ans.*

(39)
$375.176
7
2626232
4
$105.04928 *Ans.*

(40)
$400.03
6
240018
12
2880216
40003
$688.0516 *Ans.*

(41)
$521.16
7
364812
5
1824060
52116
$703.566 *Ans.*

(42)
$273.82
6
164292
3
$49.2876 *Ans.*

(43)
$45.20
6½
2260
27120
29380
6
$17.6280 *Ans.*

(44)
$1263
4¾
6315
31575
5052
599925
2
$119.9850 *Ans.*

(45)
$37.16
5
18580
2½
9290
37160
$4.6450 *Ans.*

(46)
$634.026
7
4438182
3¾
2219091
1109545
13314546
16643182
634026
$800.457 *Ans*

(47)
$416.37
6½
20818
249822
270640
2¼
67660
541280
608940
41637
$477.2640 *Ans.*

(48)
$750.506
5⅗
5)2251518
450303
3752530
4202833
4¾
2101416
1050708
16811332
$199.63456 *Ans.*

Case II. (Arith. 112.)

Note.—Each question under Case 2 is performed by taking parts of the odd months and days; and by multiplying by half the number of months in the given time.

(50)
$453.45
6
mo. | 4 | ⅓ | 272070
3
9069
81621
$90.690 *Ans.*

$453.45
20 3yrs. 4mo.=40mo.÷2=20 multip.
$90.6900 *Ans.*

(8*)

(51)

$225.375
6

mo.		
6	½	1352250
		4
		5409000
1	⅙	676125
		112687

$61.97812 *Ans.*

$225.375
27½   4yr. 7mo.=55÷2=27½

112687
1577625
450750

$61.97812 *Ans.*

(52)

143659
7

mo.		
4	⅓	1005613
		2
		2011226
1	¼	335204
da. 15	½	83801
3	⅕	41900
		8380

$248.0511 *Ans.*

(52)

143659
$14\frac{4}{5}$

5)574636

114927
574636
143659

$\frac{1}{6}$)2126153
354358

$248.0511 *Ans.*

da.
$\frac{18}{30} = \frac{3}{5}$

2yrs. 5mo.=29mo.

2)$29\frac{3}{5}$

$14\frac{8}{10} = \frac{4}{5}$

(53)

mo.		$29.08
		7
6	$\frac{1}{2}$	20356
		5
		101780
2	$\frac{1}{3}$	10178
d20	$\frac{1}{3}$	3392
		1131

$11.6481 *Ans.*

$\frac{20}{30} = \frac{2}{3}$

5yrs. 8mo.=68mo.

2)$68\frac{2}{3}$

$34\frac{1}{3}$multip.

$\frac{1}{3}$)29.08
$34\frac{1}{3}$

969
11632
8724

$\frac{1}{6}$)99841
1664

$11.6481 *Ans.*

(54)

```
                         $526.148
                               6½
                         --------
                           263074
                          3156888
        |mo. |   |      ---------
        | 6  | ½ |        3419962
        | 4  | ⅓ |              6
        |    |   |     ----------
        |    |   |       20519772
        | 1  | ¼ |        1709981
        |    |   |        1139987
                           284997
                       ----------
                     $236.54737 Ans.
                       ----------

    526148
       41½       6yrs. 11mo.=83mo.
   -------
    263074
    526148       83÷2=41½
   2104592
  --------
  21835142
        6½
  --------
  10917571
 131010852
 ---------
6)141928423
 ---------
 $236.54737 Ans.
 ---------
```

(55) 1000

8

mo.		
6	$\frac{1}{2}$	8000
		5
		40000
3	$\frac{1}{2}$	4000
da. 10	$\frac{1}{9}$	2000
2	$\frac{1}{5}$	22222
1	$\frac{1}{2}$	4444
		2222

462.8888

1000

$1462.888 *Ans.*

1000

$34\frac{43}{60}$

3000

4000

6[0)4300[0

7166

4000

3000

347166

8

6)2777328

462888

1000

$1462.888 *Ans.*

5yr. 9mo.=69

2)$69\frac{13}{30}$

$34\frac{43}{60}$ multip.

(56)

		4825
		5
mo.		
2	$\frac{1}{6}$	24125
da. 10	$\frac{1}{6}$	4021
5	$\frac{1}{2}$	670
2	$\frac{1}{5}$	335
		134

$2.92 85 *Ans.*

1yr. 2mo.=14mo.

$2)14\frac{17}{30}$

$7\frac{17}{60}$ multip.

4825

$7\frac{17}{60}$

33775

4825

6[0)8202[5

1367

33775

$\frac{1}{6}$)35142

5857

$2.92 85

(57)

7500
7

mo.		
4	$\frac{1}{3}$	52500

$175.00 *Ans.*

7500
2 the ½ of 4mo.

$\frac{1}{6}$)15000
25

$175.00 *Ans.*

(58)

$243.81
7½

12190
170667

mo.		
6	$\frac{1}{2}$	182857
1	$\frac{1}{6}$	91428
da.15	$\frac{1}{2}$	15238
10	$\frac{1}{3}$	7619
		5079

$11.9364 *Ans.*

(58)

243.81
3$\frac{11}{12}$

12)268191

22349
73143

95492
7$\frac{1}{2}$

47746
668444

6)716190.

$11.9365 *Ans.*

$\frac{25}{30}=\frac{5}{6}$

2)7$\frac{5}{6}$

3$\frac{11}{12}$ multip.

(59)

20
6

120
18

960
120

365)2160(6 nearly
2190

20
9

3[0)18[0

.06cts. *Ans.*

2)$\frac{18}{30}=\frac{9}{30}$

(60) $101.30

6

mo.		
6	$\frac{1}{2}$	60780
4	$\frac{1}{3}$	
		30390
da. 4	$\frac{1}{30}$	20260
		675

51325

10130

$106.4325 *Ans.*

15)10130

$5\frac{1}{15}$

675

50650

51325

10130

$106.4325 *Ans.*

$\frac{4}{30} = \frac{2}{15}$

$2)10\frac{2}{15}$

$5\frac{1}{15}$ multip.

(61) 224.14

7

mo.		
6	$\frac{1}{2}$	156898
2	$\frac{1}{3}$	78449
da. 10	$\frac{1}{6}$	26149
2	$\frac{1}{5}$	4358
1	$\frac{1}{2}$	871
		435

$11.0262 *Ans.*

(61)

224.14

$4\frac{13}{60}$

67242

22414

6[0)29138[2

4856

89656

$\frac{1}{6}$)94512

15752

$11.0264

$2)8\frac{13}{30}$

$4\frac{13}{60}$ multip.

(62)

		$438.24
		7
mo.		
6	$\frac{1}{2}$	306768
		4
		1227072
3	$\frac{1}{2}$	153384
da. 10	$\frac{1}{9}$	76692
2	$\frac{1}{5}$	8521
2	$\frac{1}{5}$	1704
		1704
		$146.9077

(62)

\$43824
$28\frac{22}{30}$
32137
350592
87648
$\frac{1}{6}$)1259209
209868
\$146.9077 *Ans.*

\$43824
22
87648
87648
3[0)96412[8
32137

2)$57\frac{14}{30}$
$28\frac{44}{60}=\frac{22}{30}$ multip.

(63)

\$56
7
392
2
784
98
\$7.938 *Ans.*

392
9
360)3528
98

56
12
672
84
$\frac{1}{6}$)6804
1134
\$7.938 *Ans.*

2)$24\frac{9}{30}$
$12\frac{9}{60}$ multip.

$56\times9\div60=84$

(64)

$\$28.05$

6

mo.		
6	$\frac{1}{2}$	16830
4	$\frac{1}{3}$	
		8415
da. 10	$\frac{1}{12}$	5610
5	$\frac{1}{2}$	467
2	$\frac{1}{5}$	233
		93

1.4818

28.05

$\$29.531$ *Ans.*

$\$28.05$

$5\frac{17}{60}$

$2)10\frac{17}{30}$

$5\frac{17}{60}$ multip.

19635

2805

$6[0)4768[5$

794

14025

1.4819

28.05

$\$29.531$ *Ans*

(65)

$145
$12\frac{1}{2}$

725
1740

mo.		
6	$\frac{1}{2}$	18125
2	$\frac{1}{3}$	90625
1	$\frac{1}{2}$	30208
da. 15	$\frac{1}{2}$	15104
10	$\frac{1}{3}$	7552
2	$\frac{1}{5}$	5034
		1007

$33.0780 *Ans.*

$145
$10\frac{19}{20}$

1305
145

2[0)275[5

13775
1450

158775
$12\frac{1}{2}$

79387
1905300

6)1984687

$33.078 *Ans*

$$3 \div \frac{27}{30} = \frac{9}{10}$$

$2)21\frac{9}{10}$

$10\frac{19}{20}$ multip.

(66)

$95.008

$4\frac{1}{2}$

47504

380032

mo. 3	$\frac{1}{4}$	427536
da. 15	$\frac{1}{6}$	106884
5	$\frac{1}{3}$	17814
3	$\frac{1}{5}$	5938
1	$\frac{1}{3}$	3563
		1187

$1.35386 *Ans.*

95008

$1\frac{9}{10}$

1[0)85507[2

95008

180515

$4\frac{1}{2}$

90257

722060

6)812317

$1.35386 *Ans.*

$\frac{24}{30}=\frac{4}{5}$

$2)3\frac{4}{5}$

$1\frac{9}{10}$ multip.

(67)

$1004.25
6

602550
3012

63267
100425

$1067.517

$60255 \times 18 \div 360 = 3012$

100425
$6\frac{3}{10}$

1[0)30127[5
602550

632677
100425

$1067.5177 *Ans.*

$\frac{18}{30} = \frac{3}{5}$

$2)12\frac{3}{5}$

$6\frac{3}{10}$ multip.

(68)

245.37
6

mo.		
6	$\frac{1}{2}$	147222
3	$\frac{1}{2}$	73611
da. 10	$\frac{1}{9}$	36805
2	$\frac{1}{5}$	4089
		818

$26.2545 *Ans.*

(68)

245.37

$10\frac{7}{10}$

17175[9

245370

$26.2545 *Ans.*

$\frac{12}{30}=\frac{2}{5}$

2)$21\frac{2}{5}$

$10\frac{7}{10}$ multip.

(69)

$43.226

7

302582

5

1512910

50430

12607

2521

$15.78468 *Ans.*

43.226

$31\frac{3}{10}$

12967[8

43226

129678

$\frac{1}{6}$)1352973

225495

$15.78468 *Ans.*

yr.	mo.	da.
1829	7	16
1824	4	28
5	2	18

$\frac{18}{30}=\frac{3}{5}$

2)$62\frac{3}{5}$

$31\frac{3}{10}$ multip

(70)

		1247.50
		7
mo.		
6	$\frac{1}{2}$	873250
		2
		1746500
3	$\frac{1}{2}$	436625
da. 15	$\frac{1}{6}$	218312
5	$\frac{1}{3}$	36385
3	$\frac{1}{5}$	12128
1	$\frac{1}{3}$	7277
		2425
		2459652
		124750
		$1493.465 *Ans.*

1247.50
$16\frac{9}{10}$

112275[0
748500
124750

$\frac{1}{6}$)2108275
351379

2459654
124750

$1493.465 *Ans.*

yr.	mo.	da.
1840	8	20
1837	10	26
2	9	24

$\frac{24}{30} = \frac{4}{5}$

2)$33\frac{4}{5}$

$16\frac{9}{10}$ multip.

(71)

92.14
$6\frac{1}{2}$

4607
55284

mo.		
6	$\frac{1}{2}$	59891
da. 15	$\frac{1}{12}$	29945
1	$\frac{1}{15}$	2495
		166

$3.2606 *Ans.*

92.14
$3\frac{8}{30}$

3[0)7371[2

2456
27642

30098
$6\frac{1}{2}$

15049
180588

6)195637

$3.2606 *Ans.*

yr.	mo.	da.
1834	6	6
1833	11	20
	6	16

$\frac{16}{30}=\frac{8}{15}$

$2)6\frac{8}{15}$

$3\frac{8}{30}$ multip.

(72)

		2461
		6
mo. 2	$\frac{1}{6}$	14766
		5
		73830
da. 6	$\frac{1}{10}$	2461
1	$\frac{1}{6}$	246
		41

$765.78 *Ans.*

$2461

$31\frac{7}{60}$

6[0)1722[7

287

2461

7383

$765.78 *Ans.*

yr	mo.	da.
1825	3	14
1820	1	7
5	2	7

$2)62\frac{7}{30}$

$31\frac{7}{60}$ multip.

(73)

```
$546.84
      7
-------
 382788
      3
-------
1148364
  95697
  15949
-------
126.0010
546.84
--------
$672.841 Ans.
```

```
  546.84
     19¾
  ------
4)164052
  ------
   41013
  492156
  54684
  ------
⅙)1080009
   180001
  -------
 126.0010
 546.84
 --------
$672.841 Ans.
```

```
 yr.   mo.  da.
1838    4   12
1834   12   27
---------------
   3    3   15
---------------

15   1
--=--
30   2

      2)39½
        --
        19¾ multip.
```

(74)

		300.45
		6
mo.		
6	$\frac{1}{2}$	180270
4	$\frac{1}{3}$	5
		901350
da.		·90135
12	$\frac{1}{10}$	60090
2	$\frac{1}{6}$	6009
		1001
		$105.8585 *Ans.*

30045
$35\frac{7}{30}$
3[0)21031[5
7010
150225
90135
$105.8585 *Ans.*

yr.	mo.	da.
1840	11	10
1834	12	26
5	10	14

$2)70\frac{7}{15}$
$35\frac{7}{30}$ multip

(10)

(75)

109.04
$5\frac{1}{2}$

5452
54520

59972
3831

$6.3803 *Ans.*

59972
23

360)1379356

.3831

yr.	mo.	da.
1827	7	15
1826	6	22
1	0	23

2)$12\frac{23}{30}$

$6\frac{23}{60}$ multip.

$109.04
$6\frac{23}{60}$

32712
21808

6[0)25079[2

4179
65424

69603
$5\frac{1}{2}$

34801
348015

6)382816

$6.3802 *Ans.*

CASE IV. (Arith. 116.)

(77) First 6×10yrs.=60+100=160 amount; then as $160 : $1300 : : $100 : $$812.50. *Ans.*

(78) First 7×4yrs.=28+100=128amt.; then $128 : $576 : : $100 : $450. *Ans.*

CASE V. (Arith. 116.)

(80) First $500×9yrs.=4500; and $725−500= $225ints.; then as 4500 : 100 : : 225 : 5 per cent. *Ans.*

(81) First $600×9½yrs.=5700; and $856.50−600 =$256.50; then as $5700 : $256.50 : : $100 : 4½ per cent. *Ans.*

CASE VI. (Arith. 117.)

(83) First $540×4=$21.60; and $734.40−540= $194.40; then as $21.60 : $194.40 : : 1yr : 9yrs. *Ans.*

(84) First $837×5¾=$48.12 75int.; and $1029.51−$837=$192.51; then as $48.12 75 : $192.51 00 : : 1yr. : 4yrs. *Ans.*

(85) First $1500×6=$90.00ints.; and $2332.50−$1500=$832.50; then as $90.00 : $832.50 : : 1yr. : 9yrs. 3mo. from 21yr.—9yrs. 3mo.=11yrs. 9mo. *Ans.*

INTEREST ON NOTES. (Arith. 119.)

(2)

yr.	mo.	da.
1818	2	19
1817	1	4
1	1	15

		$
		1000
		7
mo. 1	$\frac{1}{12}$	7000
da. 15	$\frac{1}{2}$	583
		291
		78.74 cts.

(2 continued.)

yr.	mo.	da.			$ cts.		$ cts.
1819	6	29			878.74	princ.	1000
1818	2	19			7	ints.	78.74
			mo.				
1	4	10	4	$\frac{1}{3}$	6151.18		1078.74
			da. 10	$\frac{1}{12}$	2050	1st pay't.	200
					170		
							878.74
					$83.71	ints.	83.71
yr.	mo.	da.			$ cts.		962.45
1819	11	14			462.45	2d. pay't.	500
1819	6	29			7		
			mo.				462.45
	4	15	4	$\frac{1}{3}$	3237.15	ints.	12.13
			da.				
			15	$\frac{1}{8}$	10.79		474.58
					1.34	3d. pay't.	260
					$12.13		214.58
						ints.	16.68
						Rem. due	$231.26
							Ans.

yr.	mo.	da.			$ cts.
1820	12	24			214.58
1819	11	14			7
			mo.		
1	1	10	1	$\frac{1}{12}$	150206
			da.10	$\frac{1}{3}$	12517
					4172
					$16.6895

(3)

yr.	mo.	da.
1810	5	1
1810	2	1
	3	0

$

500

6

mo. 3 | $\frac{1}{4}$ | 3000

7.50

yr.	mo.	da.
1811	5	1
1810	5	1
1	0	0

$ cts.

467.50

6

28.0500

yr.	mo.	da.
1811	9	16
1811	5	1
	4	15

$ cts.

445.55

6

mo. 4 | $\frac{1}{3}$ | 26.7330

da. 15 | $\frac{1}{8}$ | 8.91

1.11

10.02

	$ cts.
princ.	500
ints.	7.50
	507.50
1st. pay't.	40
	467.50
ints.	28.05
	495.55
2d,3d & 4th pay.	50
	445.55
ints.	10.02
Rem. due	$455.57
	Ans,

(4)

yr.	mo.	da.
1812	7	9
1811	6	4
1	1	5

$

700

7

mo. 1 | $\frac{1}{12}$ | 4900

da. 5 | $\frac{1}{6}$ | 408

68

$53.76

(4 continued.)

yr. mo. da.
1813 11 27
1812 7 9
1 4 18

$ cts.
675.76
7
mo. 4 | $\frac{1}{3}$ | 473032
da. 15 | $\frac{1}{8}$ | 157677
3 | $\frac{1}{5}$ | 19709
3941
$65.4359

yr. mo. da.
1814 1 17
1813 11 27
1 20

$ cts.
594.19
7
mo. 1 | $\frac{1}{12}$ | 415933
da.
15 | $\frac{1}{2}$ | 34661
5 | $\frac{1}{3}$ | 17330
5776
$5.7767

yr. mo. da.
1815 1 30
1814 1 17
1 0 13

$ cts.
531.96
7
da. 13 | yr. $\frac{1}{28}$ | 372372
13299
$38.5671

yr. mo. da.
1815 5 30
1815 1 30
4 0

$ cts.
170 52
7
mo. 4 | $\frac{1}{3}$ | 1193.64
3.97

$ cts.
princ. 700.00
ints. 53.76
753.76
1st. pay't. 78
675.76
ints. 65.43
741.19
2d. pay't. 147
594.19
ints. 5.77
599.96
3d. pay't. 68
531.96
ints. 38.56
570.52
4th. pay't. 400
170.52
ints. 3.97
Rem. due $174.49
Ans.

(5)

Principal	$850.76
Interest for 8mo. 24da.	37.433
Amount	888.193
First Payment	210.43
New Principal	677.763
Interest for 1yr. 4mo. 5da.	54.785
	732.548
Second Payment	140
New Principal	592.548
Interest for 7mo 11da.	21.825
	614.373
Third Payment	178
	436.373
Interest for 1yr. 2mo. 15da.	31.637
	468.010
Fourth Payment	154.30
	313.710
Interest for 8mo 12da.	13.175
	326.885
Fifth Payment	259.45
	67.435
Interest for 1yr. 9mo. 7da.	7.159
Remains due	$74.594 *Ans*

COMMISSION. &c. (Arith. 120.)

(1)
$1847.65
2½
92382
369530
$46.1912 *Ans.*

(3)
¼)$6543
$16.35+ *Ans.*

(2)
$5894
3¾
2947
14735
17682
$221.025

$5894.000
221.025
$5672.975 *Ans.*

(4)
2175.875
37½
1087937
15231125
6527625
$8.1595312 *Ans.*

(5)
½)$84713.716
15¾
42356858
21178429
423568580
84713716
$13342.41027 *Ans.*

(6)

$2400
1500
3900
63×
245700
4215
$28.785 *Ans.*

$843
50
$4.2150

(7)
$3750
107
26250
3750
$4012.5 *Ans.*

(8)
$67480
82½
33740
134960
539840
$55671.00 *Ans.*

(9)

$100
30
3000
7¾
1500
750
21000
$232.50

$3000
232.50
$3232.50 *Ans.*

COMPOUND INTEREST. (Arith. 121.)

(2)
$450
7

3150
450

481.50 amt. 1st. yr
7

33.7050
481.50

515.2050 amt. 2 yr.
7

36.064350
515.205

551.269350 amt. 3 yr.
450 Prin.

$101.269350 Comp. Int. *Ans.*

(3)
$550.75
6

33.0450
550.75

583.795 amt.
6

35.02770
583.795

618.8227 amt.
6

37.129362
618.8227

$655.952062 *Ans.*

(4)
$500
6

30.00
500

530 amt.
6

31.80
530

561.80 amt.
6

33.7080
561.80

595.508 amt.
6

35.73048
595.508

631.23848 amt.
500

$131.23848 Int. *Ans.*

(5)
$1200
$4\frac{1}{4}$

300
4800

51.00
1200

1251 amt.
$4\frac{1}{4}$

312.75
5004

53.1675
1251

1304.1675 amt
$4\frac{1}{4}$

3260418
52166700

55.427118
1304.1675

1359.594618 amt.
$4\frac{1}{4}$

339.898654
5438.378472

57.78277126
1359.594618

$1417.37738926 *Ans.*

BANKING.

(2)	(3)	(4)
1000	875	$1487
63×	93×	33
6[0)6300[0	6[0)81375	6[0)49071
$10.50 *Ans.*	$13.56 *Ans.*	$8.17 *Ans.*

(5)

$654	$654
123×	13.40
6[0)8044[2	$640.60 *Ans.*
$13.40	

(6)

$650	$7	2100
300	300	64.05
$1950.00 cost	$2100 sold for	2035.95
	183×	1950
	6[0)38430[0	$85.95 *Ans.*
	$64.05	

(7)

$1473

93×

6[0)13698[9

$\frac{1}{6}$)2283

380

$26.63 *Ans.*

(8)

roods.		
2	$\frac{1}{2}$	$27.50
		195×
		536250
per. 20	$\frac{1}{4}$	1375
5	$\frac{1}{4}$	34375
		8593

$5380.5468 val. of the land.

5380.546

$2\frac{3}{10}$

1[0)1614163[8

10761092

$\frac{1}{6}$)12375255

2062542

$144.37797

days.

$15+3=18 \quad \frac{18}{30}=\frac{3}{5}$

2)$4\frac{3}{5}$

$2\frac{3}{10}$ multip.

5380.546

144.377

$5236.169 *Ans.*

(11)

DISCOUNT. (Arith. 124.)

(2) First, the amount of $100 for 6mo. is $104.50: then as $104.50 : 109.64 : : $100: 104.918\frac{690}{1045}$.

(3) First, the amount of $100 for 19mo. is $107.916 +: then as $107.916 : $430.67 : : 100: 399.078\frac{98552}{107916}$. *Ans.*

(4) First the amount of $100 for 3yr. 5mo. is $123.916+ : then as 123.916 : $250.000 : : 100 : 201.749\frac{70916}{123916}$. *Ans.*

(5) First the amount of $100 for 1yr. 6mo. 20da. is 109.3333 : then as 109.3333 : $427.3800 : : $100 : $390.896 ; again $427.38—$390.896=$36.484 discount. *Ans.*

(6) First the amount of $100 for 6mo. 25da. is $103.986 + : then as 103.986 : $243.1600 : : $100 : $233.839+. *Ans.*

(7) First the amount of $100 for 6mo. at 4½ per cent. is $102.25 : then as $102.25 : $615.75 : : $100 : $602.20+. *Ans.*

(8) First the amount of $100 for 8yrs. is $140: then as $140 : $1204 : : $100 : $860 the present worth; $1204—860=$344 discount. The interest of $1204 for 8yrs. at 5 per cent. is $481.60; now $481.60—$344=$137.60. *Ans.*

EQUATION OF PAYMENTS. (Arith. 125.)

(2)

$ mo.
50×2=100
50×4=200

1[00)3[00

3mo. *Ans.*

(3)

$ mo.
50×2= 100
100×5= 500
150×8=1200

3[00)18[00

6mo. *Ans.*

(4)

$ mo.

$200 \times 3 = 600$

$100 \times 4 = 400$

$300 \times 5 = 1500$

$200 \times 6 = 1200$

800)3700(4mo. 18da. *Ans.*

3200

500

30

800)15000(18

14400

600

(5)

$ $ mo.

$5400 \div 2 = 2700 \times 6 = 16200$

$5400 \div 3 = 1800 \times 8 = 14400$

$5400 \div 6 = 900 \times 12 = 10800$

5400)41400(7mo.

37800

3600

30

5400)108000(20da.

10800

0

The amount of $100 for 7mo. 20da. is $103.8333; then as $103.8333 : $5400.0000 :: $100 : $5200.641 present worth: $5400 — $5200.641 = $199.359 discount. *Ans.*

(6)

$$\begin{array}{llll}
\$ & \$ \quad \text{mo.} & & \\
2400\div5=480 & & & \$ \\
2400\div3=800\times4=3200 & & & 2400 \\
2400\div6=400\times5=2000 & & & 1680 \\
\hline
1680 & 5200 & & 720 \\
\end{array}$$

$2400\times7=16800-5200=11.600\div720=16$mo. $3\frac{1}{3}$da. *Ans.*

BARTER. (Arith. 126.)

(2) First 4cwt. 2qr.=450lbs.×50cts.=\$225 value of the chocolate; then \$225.000÷\$1.125 = 200lb. or 2cwt. *Ans.*

(3) First $6\frac{1}{2}$cwt.=650lb.×14cts.=\$91 value of tobacco; then \$91.00÷9cts. = $1011\frac{1}{9}$lb.÷100= 10cwt. 0qr. $11\frac{1}{9}$lb. *Ans.*

(4) First, as 1bus. : 50bus. : : 70cts. : \$35 value of the rye; then as \$1.25 : \$35.00 : : 1bus. : 28bus. *Ans.*

(5) First $3\frac{1}{2}$cwt.=350lb.×5cts.=\$17.50 value of the raisins; then as \$3.36 : \$17.50 : : 1cwt. : 5cwt. 0qr. 20lb.+ *Ans.*

(6) As \$1.06 : \$0.18 : : \$1.25 : \$0.21$\frac{24}{106}$cts. *Ans.*

(7) First 41cwt.×30s.=1230s. value of the iron; then 1230s.—£20=400s.=830s.; now as 5d. : 830s.=9960d. : : 1lb. : 1992lb. *Ans.*

(8) First \$7.50×20cwt,=\$150.00 value of the tobacco; then as \$0.08 : \$150.00 : : 1lb. : 1875lb. =18cwt. 3qr. *Ans.*

(9) First 320lb.×56cts.=\$179.20 value of the chocolate; then \$179.20—\$75=\$104.20 to be laid out in cotton; now as \$.08 : \$104.20 : : 1lb. : $1302\frac{1}{2}$lb. *Ans.*

(10) First 3cwt. 2qr. 16lb.=366lb.; then as 100lb. : 366 : : $4.62½ : $16.92 the value of the tallow; again as $0.64 : $16.92 : : 1doz. : 26doz. and 28 remainder which ×12÷64=5lb. *Ans.*

(11) First $4.50×41cwt.=$184.50 the value of the hops; then $184.50−$28.50=$156 to be laid out in salt; now as $.80 : $156.00 : : 1bu. : 195bus. *Ans.*

(12) First as 1bus. : 28½bus. : : 11s. 7d.=139d.; now 139×28½=3961½ pence the value of the wheat; again as 1bus. : 40bus. : : 7s. 4d.=88d.; now 88×40=3520 pence the value of the rye; then 3961½−3520 = 441½ pence÷12÷20 = £1 16s. 9½d. *Ans.*

(13) First 189×$0.83=$156.87 the value of the linen; then as 42yds. : 1yd. : : $156.87 : 3.73\frac{21}{42}$=½. *Ans.*

(14) First, as $8.00 : $1.25 : : $8.75; then 875×125 =109375÷800=$1.367+ B's bartering price. *Ans.* Again 145barrels×$8=$1160 value of A's flour at cash price; now as $1.25 : $1160 : : 1bus. : 928bus. salt. *Ans.*

LOSS AND GAIN. (Arith. 127.)

(1) First 20cts.−16cts.=4cts. the gain on 16cts.; then as 16cts. : 100cts. : : 4cts. : $25 the gain per cent. *Ans.*

(2) First 80cts.−75cts.=5cts. the loss on 80cts.; then $.80 : $100 : : 5cts. : $6¼ *Ans.*

(3) First $184.32−153.16½=$31.15½; then as 980lb. : 1lb. : : $31.155 : $.031+ gain on a pound; again as $153.165 : $100 : : $31.155 : $20+ per cent. *Ans.*

(4) First 7 tuns=28hhd.×$67=$1876 cost of the wine; again 7 tuns = 14112 pints × 19cts.= $2681.28 sold for; now $2681.28−$1876 = $805.28 whole gain. *Ans.* Then as $1876 : $100 : : $805.28 : $\$42.925\frac{700}{1876}$ gain per cent.

(5) As $100 : $100+15=115 : : $3.43 : $3.944+

(6) As $100 : $100−12½=87½ : : $0.40 : 35cts. *Ans.*

(7) First 90gal.×$1.20=$108 cost of wine; then as $100 : $100 + 12½= 112½ : : 108 : $121.50 the whole to be sold for; again as 80gal. : 1gal. : : $121.50 : $1.518+ *Ans.*

(8) As $100+12½=112½ : $100 : : $4.05 : $3.60*Ans.*

(9) As $100−15=85 : $100 : : 1.25 : $1.47+ *Ans.*

(10) As $100−10=90 : $100 : : $67.50 : $75 *Ans.*

(11) First as $1.4375 : $1.50 : : $115; now 150× 115=17250÷14375=120−100=$20 *Ans.*

(12) As $2.50 : $2.10 : : 100+10=110; now 210× 110 = 23100 ÷ 250 = $92.40; again $100− $92.40=$7.60 *Ans.*

PROMISCUOUS QUESTIONS. (Arith. 129.)

(13) First, as $120 : 100 : : $490 : $408.333 the first cost of the whole; then as 375yd. : 1yd. : : $408.333 ; $1.088+ *Ans.*

(14) By discount. First the amount of $100 for 9mo. at 7 per cent.=$105.25; then as $105.25 : $130.00 : : $100 : $123.515+ the present worth; now $123.515−$120=3.515 the whole loss; again say as $123.515 : $100 : : $3.515 : $2.845+ *Ans.*

(15) As $100−20=80 : $100 : : $3.25 : $\$4.062\frac{4}{8}=\frac{1}{2}$

(16) First, as $100−25=75 : $100 : : $95 : $126.666+ first cost; again as $100 : 130 : : $126.666 : $164.666 should have been sold for; now $164.666−$95=69.666 under the value.

(17) First as $9.00 : $6.48 : : $125 : $90; now $100—$90=$10 *Ans.*

(18) First as $108 : 100 : : $14.25 : $13.194+ cost of the 12 yards; then as 12yd. : 1yd. : : $13.194 : $1.099 *Ans.*

(19) First as $120 : $100 : : $1 : $0.8333+ the cost of the corn a bushel; then as $100 : $130 : : $0.8333 : $1.0833+ per bushel. *Ans.* Again $54.00÷$1.0833+=49bus. 3pk. 3+qts. *Ans.*

(20) First as $100 : $95 : : $157.50 : $149.625; then 63—18=45gal. : 1gal. : : $149.625 : $3.32½ *Ans.*

(21) First as $100 : $95 : : $157.50 : $149.625; then as $3.325 : $149.625 : : 1gal. : 45gal.—63gal.=18gal. *Ans.*

(22) First as 1gal. : 45gal. : : $3.325 : $149.625; then as $100 — 5 = $95 : $100 : : $149.625 : $157.50. *Ans.*

(23) First as 1gal. : 45gal. : : $3.325 : $149.625; then $157.50—$149.625 = $7.875; again as $157.50 : $100 : : $7.875 : $5 per cent. *Ans.*

SINGLE FELLOWSHIP. (Arith. 131.)

(2)

	$		$	$	$	$	
D.	140	As	600 :	140 : :	120 :	28	D's. share.
E.	300		600 :	300 : :	120 :	60	E's. share.
F.	160		600 :	160 : :	120 :	32	F's. share.
	$600						

(3)

	tuns.		tuns.	tuns.	tuns.	tuns.	
A.	48	As	108 :	48 : :	45 :	20	A's.
B.	36		108 :	36 : :	45 :	15	B's.
C.	24		108 :	24 : :	45 :	10	C's.
	108						

(4)

3 As 12 : 360 : : 3 : 90 first *Ans.*
4 12 : 360 : : 4 : 120 second *Ans.*
5 12 : 360 : : 5 : 150 third *Ans.*
—
12

(5)

sh. sh. sh. $ $
Captain, 11 As 33 : 11 : : 4056 : 1352 captain's.
Mate, 6 33 : 6 : : 4056 : 737.45+mate's.
Sailors, 16 33 : 1 : : 4056 : 122.90+each sail.
—
33

(6)

The first travelled 160 miles.
The second do. 160 do.
A. do. 140 do.
B. do. 95 do.
C. do. 25 do.
—
580
—

As 580m. : 160m. : : $25 : $6.896+ first two pay.
580m. : 140m. : : $25 : $6.034+ A. pays.
580m. : 95m. : : $25 : $4.094+ B. pays.
580m. : 25m. : : $25 : $1.077 C. pays.

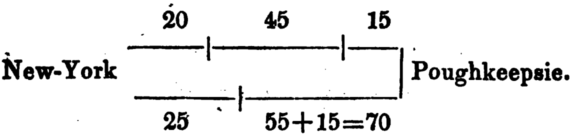
If they pay in proportion to the number in the carriage; say as 160 m. : 20m. : : $25 : $3.125 the two first pay for 20m.; then $3.125÷2=$1.5625 what each pays for 20m. Again, as 160 : 45m. : : $25 : $7.0312 what three pay for 45m.; then $7.0312 ÷3=$2.3437 what each pays for 45m. Again, as 160 : 70m. : : $25 : $10.9375 what four pay for 70m.; then 10.9375÷4=$2.7344 what each pays for 70m. Again, as 160 : 25 : : $25 : $3.9062 what five pay for 25m.; then $3.9062÷5=$0.7812 what each pays for 25m.

(6 continued.)

Now $1.5625	$2.3437
2.3437	2.7344
2.7344	.7812
.7812	$5.8593 A. pays.
Each of the two first $7.4218 *Ans.*	

2.7344
7812

$3.5156 B. pays.



(7) First $140 A. put in+$250 B. put in=$390 A. and B. put in; then $230 whole gain−$100 C's. gain=$130 A. and B's. gain. Again, as $130 A. and B's gain : $100 C's gain : : 390 A. and B's. stock : $300 C's stock; now120yds. : 1yd. : : $300 : $2.50 C's. cloth a yard. *Ans.* Again, as $390 A. and B's. stock : $140 A's. : : $130 A and B's. gain : $46.666+A's.gain.

As 390 : $250 B's. : : $130 : $83.333+B's. gain. *Ans.*

COMPOUND FELLOWSHIP. (Arith. 132.)

(2)

stock. time. prod.
A. 620 × 8 = 4960
B. 950 × 11 = 10450
C. 730 × 13 = 9490

24900

sum. prod. \$ \$
As 24900 : 4960 : : 1800 : 358.554$\frac{54}{249}$ A's.
24900 : 10450 : : 1800 : 755.421$\frac{171}{249}$ B's.
24900 : 9490 : : 1800 : 686.024$\frac{24}{249}$ C's.

(3)

First, A's. 45sheep ÷ 5 = 9steers
B's. 60 do. ÷ 5 = 12 do.
Then, A's 15strs. × 4 = 60
9strs. × 5 = 45

105

B. 20strs. × 5 = 100
12strs. × 3 = 36

B's. prod. 136
A's. do. 105

241

Now, as 241 : 105 : : \$30 : \$13.07 + A's. *Ans.*
241 : 136 : : \$30 : \$16.92 + B's. *Ans.*

(4)

$$\text{A's.}\left\{\begin{array}{l} \quad\$ \qquad\quad \text{mo.} \qquad \text{prod.} \\ 873.60\times4=349440 \\ \quad 96 \\ \hline 969.60\times8=775680 \end{array}\right.$$

$$\begin{array}{r} \hline 1125120 \\ \hline \end{array}$$

$$\text{B's.}\left\{\begin{array}{l} \quad\$ \qquad\quad \text{mo.} \qquad \text{prod.} \\ 979.20\times7=685440 \\ 206.40 \\ \hline 772.80\times5=386400 \end{array}\right.$$

$$\begin{array}{r} \hline 1071840 \\ \hline \end{array}$$

$$\text{C's.}\left\{\begin{array}{l} \quad\$ \qquad\quad \text{mo.} \qquad \text{prod.} \\ 355.20\times3=106560 \\ 206.40 \\ \hline 561.60\times5=280800 \\ 240 \\ \hline 801.60\times4=320640 \end{array}\right.$$

$$\begin{array}{r} \hline 708000 \\ \hline \end{array}$$

$$\begin{array}{llr} \text{A's. product} & & 1125120 \\ \text{B's.} & \text{do.} & 1071840 \\ \text{C's.} & \text{do.} & 708000 \\ \hline & & 2904960 \\ \hline \end{array}$$

$$\begin{array}{lrrrl} & \text{sum.} & \text{prod.} & \$ & \quad\$ \\ \text{As } & 2904960 : & 1125120 :: & 3446.40 : & 1334.82\tfrac{148608}{290496} \text{ A's.} \\ & 2904960 : & 1071840 :: & 3446.40 : & 1271.61\tfrac{131904}{290496} \text{ B's.} \\ & 2904960 : & 708000 :: & 3446.40 : & 839.96\tfrac{9984}{290496} \text{ C's.} \end{array}$$

EXCHANGE. (Arith. 135.)

(2)
£
$\frac{1}{3}$)1500
500
£2000 *Ans.*

(3)
£
$\frac{1}{5}$)100
20
£80 *Ans.*

(4)
£ s. d.
933 6 8
5×9=45
4666 13 4
9
28 { 7)42000 0 0
4)6000
£1500 *Ans.*

(5)
£. s. d.
$\frac{1}{3}$)120 8 3
40 2 9
£160 11 0 *Ans.*

(6)
£ s.
$\frac{1}{4}$)116 10
29 2 6
£87 7 6 *Ans.*

(7)
£ s.
$\frac{1}{16}$)120 10
7 10 7½
£112 19 4½ *Ans.*

(8)
£ s. d.
112 7 3
9
7)1011 5 3
144 9 3+ *Ans.*

(9)
£
$\frac{1}{16}$)800
50
£750 *Ans.*

(10)

£ s. d.
$\frac{1}{5}$)214 9 2
42 17 10

£171 11 4 *Ans.*

(11)

£ s.
$\frac{1}{5}$)108 10
21 14

£86 16 *Ans.*

(12)

£
$\frac{1}{4}$)180
45

£135 *Ans.*

(13)

£ s. d.
$\frac{1}{4}$)625 6
156 6 6

£468 19 6 Virg.

£ s.
625 6
20

8)12506

\$1563.25 Fed. mo.

FOREIGN EXCHANGE. (Arith. 136.)

(1) As 1liv. : 250liv. : : \$0.185 : \$46.25 *Ans.*

(2) As \$185 : \$87.10 : : 1liv. : $470\frac{150}{185}$ *Ans.*

(3) 500guild. × \$.39 = \$195 *Ans.*

(4) As 1guild. = 20sti. : 241guild. 14sti. = 4834sti. : : \$.39 : \$94.263 *Ans.*

(5) \$4.4444 × £350 = \$1555.555 + *Ans.*

(6) As \$4.444 : \$1474.80 : : £1 : £331 16s. 9+d. by saving fractions.

(7) As 1ri. : 1786ri. : : \$0.10 : \$178.60 *Ans.*

(8) 218millrees × \$1.24 = \$270.32 *Ans.*

(9) 35668tales of Chi. × \$1.48 = \$52788.64 *Ans.*

(10) \$97.68 ÷ \$66 = 148rubles. *Ans.*

(11) As \$0.555 : \$54.39 : : 1rup. : 98rupees. *Ans.*

(12) First, as £1=240d. : 33s. 4d.=400d. : : £373 16s. 8d.=161720d. ; now 161720×400=64688000÷240=$269533\frac{8}{24}$÷12=22461s. 1d.÷20=£1123 1s. and $\frac{8}{24}$ of a penny=$\frac{1}{4}$ of a penny, which put together make £1123 1s. $1\frac{1}{4}$d. *Ans.*

PROMISCUOUS QUESTIONS. (Arith. 139.)

(1) As 14lb. : 100lb. : : 13s. : £4 12s. $10\frac{1}{4}$+d. *Ans.*

(2) First, £225 12s.=4512s.÷8s. $1=$564 *Ans.*

(3) $187.15 × 12, half the number of months = $22.458 *Ans.*

(4) They row 7 miles an hour, the wind and tide advance them $\frac{1}{2}$ mile an hour=$7\frac{1}{2}$ miles, the current retarding 2 miles an hour, they go through the water $5\frac{1}{2}$ miles an hour or 11 half miles ÷320 half-miles=29h. 5m. 27sec. *Ans.*+

(5) 38cwt. 3qr. 1lb.=3876lb.÷68=57 *Ans.*

(6) 29gui.×28=812×12×4=38976qrs. *Ans.*

(7) $550×7per cent.=$38.50×4yrs.=$154 *Ans.*

(8) 45mi.−37m.=8×12=96mi. *Ans.*

(9) First, $35\frac{1}{2}$yds. + 36+$37\frac{1}{2}$+38 = 147yds.: then 147yds.×79cts.=$116.13 *Ans.*

(10) First cost $472.05, cooperage 40tubs×12cts.= $4.80 which must be + to the cost,+$4828 salt and labor+$6.46 the whole added together make $488.138, and 36cwt. 2qr. 14lb.=3664lb.: then say, as 3664lb. : 1lb. : : $488.138 : $0.133+

(11) $1525×$4\frac{1}{2}$ per cent.=$68.625 *Ans.*

(12) First 140tier. salt×$4.70=$658, value of the salt; then $658÷$2=329quintals. *Ans.*

(13) $1048.8325 which is the same as $\$1048.83\frac{1}{4}\times$ 96=1006879200; now cut off four figures if the 96 is multiplied by $1048.8325, but if the

\$1048.83¼ is multiplied, then cut off but two figures which 10068792 ÷ 12÷20=£419 10s. 7¾d. *Ans.* The 92 must be × 4, and two figures cut off and what is left will be the ¾ farthings.

(14) First \$5.000÷8yd.=\$0.625 the cost of 1yd.; \$4.00÷5yds.=\$0.80 sold for a yard; then \$0.80 —\$0.625=\$0.175 the gain on one yard; then say, as \$0.175 : \$15.75 : : 1yd. : 90yds. *Ans.*

(15) First the amount of \$100 for 1yr. at 7 per cent. =\$107; then as \$107 : \$1000 : : \$100 : \$934.579; now from \$940—\$934.579=\$5.421 *Ans.*

(16) First 3cwt. 1qr. 5lb.—14tare=3cwt. 0qr. 16lb. ×20bbls.=63cwt. 0qr. 20lb. *Ans.*

(17) First \$50×2mo.=100; and \$40×5mo.=200; and the remainder \$30×7mo.=210: now 100+200+210=510÷120=4¼mo. *Ans.*

(18)

$$\left.\begin{array}{lr} \text{horses} & 14 : 20 \\ \text{days} & 16 : 24 \end{array}\right\} : : 56 \text{ bushels.}$$

$$\frac{\overset{5}{\cancel{20}}\times\overset{6}{\cancel{24}}\times\overset{4}{\cancel{56}}}{\cancel{14}\times\underset{4}{\cancel{16}}}$$

5×6×4=120 *Ans.*

(19) First 50oz. 8dwt.=1008dwt.: and 2oz. 16dwt.=56dwt.; then 1008÷56=18spoons. *Ans.*

(20) First as 1da. : 365da. : : \$2.42 : \$883.30 he spends a year; then \$1250—\$883.30=\$366.70.

(21) First \$756.252×4 per cent.=\$30.25 the interest for 1yr.; then \$30.25÷13 because 4 weeks is $\frac{1}{13}$ of a year or 52 weeks=\$2.326 *Ans.*

(22) First as 1gal. : 4hog.×63gals. = 252gals. : : \$1.1875 : \$299.25 the value of the wine; then \$299.25÷134=\$2.23+ *Ans.*

(23) First B's. \$950×5 = 4750 : and C's. 785×6 = 4710 ; then 4750 + 4710 = 9460 : now as 9460 the sum : 4750pro. : : \$275.184 : \$138.173$\frac{742}{9460}$; then \$275.184 – \$138.173 = \$137.01 C's share. *Ans.*

(24) First 35cts.–28cts.=7cts. B's. gain when sold for 35cts. a bushel; now as 7cts. gain : 25cts. gain : : 35cts. sold for : \$1.25 A's. corn sold for.

(25) First \$9432÷$\frac{1}{3}$=\$3144 widow's portion : then \$9432–3144=\$6288 to be divided among the children. Again 2sons×\$4=8 product and 3 daugh.×3=9 product and 8+9=17 sum of the products; then say, as 17 : 8 or 4 one son : : \$6288 ; then \$6288×4=25152÷17=\$1479.529 +each son's portion. As 17 : 9 or 3 one daugh. : : \$6288 : \$1109.647+each daughter's portion.

(26) First 16gal.–10gal.=6gal. remains in 30 minutes; then say, as 6gals. : 130gals. : : 30min. : 10ho. 50min. *Ans.*

(27) $2)\frac{35}{30}=\frac{35}{60}=\frac{7}{12}$ multip. \$45.70×7÷12=\$.2665 *Ans.* \$45.70×6 per cent. = \$2.742 interest for one year; then as, 365days : 35days : : \$2.742 : \$.262$\frac{340}{365}$ *Ans.* in note.

(28) As the hounds run 2$\frac{1}{2}$ rods while the fox runs one, they would gain 1$\frac{1}{2}$ rods on the fox every rod the fox runs; then 1$\frac{1}{2}$rods=3half-rods : 100rods=200half-rods : : 1rod the fox runs to the whole distance run by the fox : 66$\frac{2}{3}$ *Ans.*

(29) As \$100 : \$125 : : \$.75 : \$0.9375 *Ans.*

(30) First 50ft. 11in.=611in. h'ht : 300ft. 8in.=3608in. : : 98ft. 6in.=1182in.; then 3608×1182=4264656

÷611=6979$\frac{487}{611}$in. the length of the shadow of the steeple÷12=581ft. 7in.; now 20ft. 6in. shade on one side the river+30ft. 9in. shade on the other side=51ft. 3in. Again 581ft. 7in.—51ft. 3in.=530ft. 4in.÷3ft. in a yard=176yds. 2ft. 4in. *Ans.*

(31)

		$754.48
		5
mo.		
6	$\frac{1}{2}$	37.7240
		3
		113.172
1	$\frac{1}{6}$	18.862
da. 10	$\frac{1}{3}$	3.1436
2	$\frac{1}{5}$	1.0478
		.2095
		$136.4349 *Ans.*

$754.48
21$\frac{7}{10}$

1[0)52813[6
75448
150896

$\frac{1}{6}$)16372216
2728702

$136.43514 *Ans.*

$\frac{12}{30}=\frac{2}{5}$

2)43$\frac{2}{5}$

21$\frac{7}{10}$ multip.

(32)

£25327 began to trade.
6×1253= 7518 cleared in 6 years.
5×1729= 8645 do. in 5 do.

41490
4×3019=12076

29414 *Ans.*

(33) As 21cows : 6cows : : 91da. : 26da. *Ans.*

(34) First, as 9pea. : 15pea. : : 6cts. : 10cts. the price of the 15peaches; then as 2cts. : 10cts. : : 8ap. : : 40ap. *Ans.*

(35) First 1bus.=32qts.−13qts.=19 the number of qts. of buck-wheat in each bushel; then as 13qts. : 19qts. : : 21bus. : 30bus. 2pks. 6qts. + *Ans.*

(36)

	yrs.	da.	ho.	mi.	sec.
¼)	15	19	11	37	45

365¼ or 6ho.× and add 19da.

3¾ or 18ho.+11=29ho.
75
90
45

5478
24× and add 29ho.

131957
60×

7917457min.
60×

475047465sec. *Ans.*

(37) First he lost $17 per cent. which subtracted from $100=$83; but he should have gained $20per cent.+$100= $120; therefore say as $83 : $120 : : $50 : $72.288 + what it should have been sold for — $50 = $22.288, leaves what it was sold for less than its value. *Ans.*

(38) First 45bus.×42d.=1890d.÷by $1 or 96d.= $19.6875cost; then 45bus.×32qts.=1440qts.× 3cts.=$43.20 sold for. *Ans.* Again 43.20— $19.6875=$23.5125gained. *Ans.*

(39) As 3eggs : 6doz.=72eggs : : 2cts. : 48cts. *Ans.*

(40) $246.41×6 = $14.7846 interest + $246.41 = 261.1946amt. × 6 = $15.671676int. + $261.1946=276.866276amt.×6=$16.61197656int.+ $276.866276=$293.47825256amt.—$246.41= $47.06825256 *Ans.*

(41) First 100in.—7½=92½in.; then as 7½in. : 92½ : : 168lb. : 2072lb. *Ans.*

(42) As 7½in. : 100in. : : 168lb. : 2240lb. *Ans.*

(43) First 15rods—13rods=2rods which the hindermost gains every 15rods he runs; then say as 2rods gained : 6rods to be gained : : 15rods run : 45rods run. *Ans.*

(44)

yards 2 : 60 }
qrs. wide. 5 : 3 } : : 1½lb.

$$\frac{\overset{\overset{6}{\cancel{12}}}{\cancel{60}}\times 3\times 1\tfrac{1}{2}}{\cancel{5}\times\cancel{2}}=6\times 3\times 1\tfrac{1}{2}=27\text{lb.}$$ *Ans.*

(45) As 1bus. : 37 : : 3s. : 111s.÷20=£5 11s. *Ans.*

(46) 7rows×11trees=77×55=4235gals.×6years= 25410gals.÷63=403hhds. 21gals.÷4=100tuns 3hhd. 21gals. *Ans.*

(47)

Principal	$1425.
Interest for 8mo. 16days .	70.933
	1495.933
First payment . . .	405.
	1090.933
Interest for 1yr. 2mo. 17da. .	92.69899
	1183.63199
Second payment	512.50
	671.13199
Interest for 1yr. 0mo. 27da. .	50.50268
	721.63467
Third payment . . .	200.
	521.63467
Interest for 5mo. 13da. . .	16.532
	$538.166 *Ans.*

(48) The amount of $100 for 4½ mo. at 8per cent. =$103; then as $103 : $100 : : $5150 : $5000 the present worth. Again $5000×1per cent.=$50; and $5000−$50=$4950 *Ans.*

(49) As 8s. = 16sixpences : 4s. 6d.=9sixpences : : £477 8s. 8d.; now £477 8s. 8d.×9=£4296 18s.÷16=£268 11s 1½d. *Ans.*

(50) First add into one sum the first cost, freight, loading and unloading, customs, charge of cellar, and the gain=$4469.31; then as 46tuns : 26tuns : : $4469.31 : 2526.13\frac{8}{46}$ *Ans.*

(51) As 1crown : 800crowns : : 4s. 6d. : £180 *Ans.*

(52) As $600 : $80 : : 15yrs. : 2yrs. *Ans.*

(53) As 2yds. serge : 3yds. shalloon : : 237yds. serge : 355$\frac{1}{2}$yds. shalloon ; then 355$\frac{1}{2}$yds. + 237 yds.= 592$\frac{1}{2}$yds. in both. Again as 592$\frac{1}{2}$yds. : 1yd. : : $240 : $0.405+ *Ans.*

(54)

$6374.75
7

| 6 | $\frac{1}{2}$ | 4462325
| 4 | $\frac{1}{3}$ | 2

8924650
2231162
1487441

$1264.3253 *Ans.*

$6374.75
17

4462325
637475

$\frac{1}{6}$)10837075
1806179

$1264.3254 *Ans.*

2)34 months.

17 multip.

(56)

As each boy had 1sha., 9 boys would have 9 shares.
each woman 2 shares, 6 women 12 do.
each man 4 shares, 4 men. 16 do.

the whole must be divided info 37 do.
Then $183.94÷ 37=$4.971+ 1 share ; boys.
$ 4.971× 2=$9.942+ 2 shares ; women.
$ 4.971× 4=$19.884+ 4 shares ; men

(57) First 5da.×20mi.=100mi. A. travels before B. starts, and 25−20=5mi. B. gains on A. each day: then as 5mi. gain : 100mi. to be gained : : 25mi. that B. travels a day : 500mi. to be travelled. Again 500÷25=20mi. each da. *Ans.*

(58) As 365da. 6ho. = 525960min. : 1min. : : 596.900000 : $1134\frac{461360}{525960}$ *Ans.*

(59) First 60pie.×\$4=\$240 sold for.
60pie.×\$3=\$180 cost.
Then as \$180 : \$240 : : \$240 : \$320 *Ans.*

(60) If on 10 tons he makes \$35.00÷10=\$3.50 makes on 1 ton; then \$35+\$3.50=\$38.50 *Ans.*

(61) First A. put in \$20+B. and C. put in \$85=\$105 whole stock; then as \$105 whole stock : \$20A's. stock : : \$63 the whole gain : \$12 A's gain. Again from the whole gain \$63−\$12 A's gain = \$51 B. and C's. gain; and from B. and C's. gain \$51−\$21=\$30 C's. gain; then as \$51 B. and C's. gain : \$30 C's.gain : : \$85 : \$50 C's. stock, and \$85−\$50=\$35 B's. stock.

(62) First 350gals.×\$1.47½=\$516.25 sold for; then as \$118 : \$100 : : \$516.25 : \$437.50. Again \$516.25−\$437.50=\$78.75 *Ans.*

(63) First 12s. 6d.—10s.=2s. 6d. gain; then as 2s 6d.=30d. : 10d. : : 10s. cost : 3s. 4d. cost. *Ans*

(64)

	£	s.	d.	
	256	16	6	Georgia.
			9	
7)	2311	8	6	
Add $\frac{1}{4}$)	330	4	$0\frac{3}{4}$	Virginia.
	82	11	$0\frac{1}{4}$	
Add $\frac{1}{15}$)	412	15	1	Pennsylvania.
	27	10	4	
	440	5	5	New-York.

(65) First \$8,000,000+\$12,000,000=\$20,000,000 whole expense; then 20,000,000÷50÷60÷12 ÷6÷52=1yr. 40we. 3da. 6ho. 40min. Again \$20,000,000÷16=1,250,000lbs. and 1,250,000÷100 = 12500cwt.÷ 20 = 625tons; 12500cwt.÷ 18cwt. = $694\frac{4}{9}$ wagons; $694\frac{4}{9}$ × 8 rods=$5555\frac{5}{9}$ rods; $5555\frac{5}{9}$ ÷ 220 rods ÷ 8fur. = 3mi. 1fur $55\frac{5}{9}$yds. distance *Ans.*

(66) First grandfather's age 112—82=30 my age; then father's age 64—30=34 years' difference.

(67) First 21rods—15=6gain; then as 6rods gain : 96rods to be gained : 21rods run : 336rods. *Ans.*

(68) As \$8.750 : \$10.625 : : \$130 : \$$157.857\frac{125}{875}$; then \$157.857—\$100=\$57.857+ *Ans.*

MENSURATION. (Arith. 146.)

Case I.

(1) As 7 : 22 : : 56 : 176in. first rule; as 113 : 355 : : 56 : $175\frac{105}{113}$ second rule; 3.1416×56=175.9296 third rule.

2) As 7 : 22 : : 18in. : $56\frac{4}{7}$in. *Ans.*

(3) As 7 : 22 : : 7970mi. : 25048mi. 4fur. 22po.+ *Ans.*

(4) As 22 : 7 : : 16ft. 4in. : 5ft. $2\frac{8}{22}$ft. *Ans.*

(5) As 355 : 113 : : 710ft. ; then 113×710=80230÷355=226ft. *Ans.*

CASE II. (Arith. 147.)

(6) 12×12=144×.7854=113.0976 *Ans.*

(7) 576×576=331776×.7854=260576.8704ft. *Ans.*

(8) First 1mi.=320rods×320=102400 square rods ; then 102400×.7854×80424.9600 square rods in a mile ; 80424÷40÷4=502ac. 2r. 24per. in a mile. *Ans.* Again 2mi.=640r.×640=409600 rods ; then 409600×.7854 = 321699.8400rods ; 321699÷40÷4=2010ac. 2rods. 19per. *Ans.*

CASE III. (Arith. 147.)

(9) 15in.×11in.=165in.×.7854=129.5910in. *Ans.*

(10) 88ft.×72ft.=6336×.7854=4976.2944ft. *Ans.*

PROMISCUOUS QUESTIONS. (Arith. 147.)

(11) First as 7 : 22 : : 50ft. : $157\frac{1}{7}$ft. *Ans.* Again 50×50=2500×.7850 = 1963.5 the whole area, and 12×12=144×.7854=113.0976 the circle round the centre not covered with canvass ; now 1963.5−113.0976=1850.4024 square feet to be covered with canvass. Again 1yd.=3ft. ; and $\frac{3}{4}$yd.=$2\frac{1}{4}$ft. ; and 3ft.×$2\frac{1}{4}$ft.=$6\frac{3}{4}$ square feet in each yard of canvass ; 1850ft. or 7400qrs.÷$6\frac{3}{4}$ft. or 27qrs.=274+yds. *Ans.*

(12) As 7 : 22 : : 60rods : $188\frac{4}{7}$rods. *Ans.* Again 60×60=3600×.7854=2827.44 sqr. rods in the field ; then as 160rods : 2827.44rods : : 25bus. ; now 2827.44× 25 =70686÷160 = 441bus. 3p. $1\frac{1}{5}$qt. *Ans.*

Case iv. (Arith. 148.)

(13) 28in.×28 = 784 × .7854 = 615.7536 × 25 = 15393.8400÷144=$106\frac{129}{144}$ft. *Ans.*

(14) 21in.×21=441×35=15435÷144=$107\frac{27}{144}$.

Case v. (Arith. 148.)

(15) 16in.×16=256 ; and 24ft. 9in.÷$\frac{1}{3}$=8ft. 3in.; now 256×$8\frac{1}{4}$=2112÷144=$14\frac{96}{144}$ft. *Ans.*

(16) 18×18=324×.7854=254.4696×10 or $\frac{1}{3}$ of 30 =2544÷112=$17\frac{96}{144}$ *Ans.*

Case vi. (Arith. 149.)

(17) First 12 × 12 = 144 ; 8×8=64 ; 12× 8=96 ; then 144+64+96=304×10 the $\frac{1}{3}$ of 30=3040 ÷144=$21\frac{16}{144}$ft. *Ans.*

(18) First 15×15 = 225 ; 9×9=81 ; 15×9=135 ; then 225+81+135=441×9 the $\frac{1}{3}$ of 27=3969 ÷144=$27\frac{81}{144}$ft. *Ans.*

Case vii. (Arith. 149.)

(19) First 12×12 = 144 ; 9 × 9=81 ; 12×9=108 ; and 144+81+108 = 333×30=999000÷382= $2615\frac{70}{382}$÷144=$18\frac{23}{144}$ft. *Ans.*

(20) First 23×23 = 529 ; 15×15 = 225 ; 23×15= 345 ; and 529+225 + 345=1099×34ft. 8in.= 3809800÷382=$9973\frac{114}{382}$÷144=$69\frac{37}{144}$ft. *Ans.*

Case viii. (Arith. 149.)

(21) First $\frac{1}{2}$ of 18=9×9=81×2=162×30=4860÷ 144=$33\frac{108}{144}$ft. *Ans.*

(22) First $\frac{1}{2}$ of 22=11×11=121×2=242 × 28= 6776÷144=$47\frac{8}{144}$ft. *Ans.*

CASE IX. (Arith. 150.)

(23) First $\frac{1}{2}$ of $18=9\times9=81\times2=162\times16=2592\div144=18$ft. ; then as $1\frac{1}{2}$in. : 12in. : : 18ft. : 144.

(24) First $\frac{1}{2}$ of $24=12\times12=144\times2=288\times28=8064\div144=56$ft. ; then as $1\frac{3}{4}$in. : 12in. :: 56ft. : 384ft. *Ans.*

CASE X. (Arith. 150.)

(25) $16\times15=240\div12=20$ft. *Ans.*

(26) 15ft.×13in.×14bds.=2730in. ; 17ft.×17in.×8 bds. = 2312in. ; 18ft. × 11in.×23bds.= 4554 : then $2730+2312+4554=9596\div12=799\frac{2}{3}$ft. *Ans.* Again as 1000ft. : $799\frac{2}{3}$ft. : : \$13.50 : \$10.79+ *Ans.*

CASE XI. (Arith. 151.)

(27) $5\times3=15\times16=240\times4=960\div12=80$ft. *Ans.*

(28) $6\times3\frac{1}{2}=21\times10=210\times24=5040\div12=420$ft.

GAUGING. (Arith. 151.)

CASE I.

(1) $60\times60\times60=216000\div231=935\frac{15}{231}$ wine gallons *Ans.* $216000\div282=765\frac{270}{282}$ beer gallons. *Ans.*

(2) $82\times82=6724\times82=551368\div231=2386\frac{202}{231}$ wine gallons ; $551368\div282=1955\frac{58}{282}$ beer gals. *Ans.*

CASE II. (Arith. 152.)

(3) $95\times58=5510\times28=154280$ solid inches.
$154280\div2150=71\frac{163}{215}$ bushels.
$154280\div231=667\frac{203}{231}$ wine gallons.
$154280\div282=547\frac{26}{282}$ beer gallons.

(4) $112\times72=8064\times48=387072$ solid inches.
$387072\div231=1675\frac{147}{231}$ wine gallons.
$387072\div282=1372\frac{168}{282}$ beer gallons.
$1372\frac{168}{282}\div36=38\frac{1296}{10152}=\frac{6}{47}$ by Case 2, page 89, Vulgar Fractions.
$387072\div2150=180\,\frac{72}{2150}$ bushels. *Ans.*

Case III. (Arith. 152.)

(5) $32\times32\times2=2048$ bulge diameter.
$26\times26=676$ head diameter.
$2048+676=2724\times40=108960$
$108960\div1077=101\frac{183}{1077}$ beer gallons.
$108960\div882=123\frac{474}{882}$ wine gallons.

(6) $40\times40\times2=3200$ bulge diameter.
$36\times36=1296$ head diameter.
$3200+1296=4496\times60=269760$
$269760\div1077=250\frac{510}{1077}$ beer gallons.
$269760\div882=305\frac{750}{882}$ wine gallons.

Case IV. (Arith. 152.)

(7) $7\times7\times7=343\times.5236=179.5948$in. *Ans.*

(8) $7970\times7970=63520900\times7970=506261573000\times .5236=265078559622.8000$ miles. *Ans.*

BURDEN OF SHIPS. (Arith. 153.)

(1) 95ft. length $\times$ 32 breadth $=3040\times16$ depth $=48640\div95=512$ tons. *Ans.*

(2) First 300ft. $\times$ 22in. a cubit $=6600$ length in in.
50ft. $\times$ 22 " $=1100$ breadth.
30ft. $\times$ 22 " $=660$ depth.
Then $6600\times1100\times660=4791600000\div1728=2772916\frac{1152}{1728}\div95=29188\frac{56}{95}$ tons.

PROMISCUOUS EXAMPLES.

(1) 40×30×6=7200ft. *Ans.* Then 7200÷27ft. in a yd.=$266\frac{2}{3}$ solid yds. Again $266\frac{2}{3}$×$12\frac{1}{2}$cts.=\$$33.33\frac{1}{3}$ *Ans.*

(2) First 7ft.=84in.×84=7056×.7854= 5541.7824 ×96in. the depth=532011.1104÷231=2303g'l. ÷63=36hhd. 35gal. *Ans.* 532011÷282÷63= 29hhd. $59\frac{53}{94}$ gals. beer. *Ans.*

(3) First 10ft.=120in.×120=14400
8ft.= 96in.× 96= 9216
120in.× 96=11520
14400+9216+11520=35136×114in. depth.= 400550400 ÷ 382=1048561÷231=4539÷63= 72hhds. 3gals.+ *Ans.*

(4) First 1mi. = 320rods × $16\frac{1}{2}$ft.=5280ft.×2mi.= 10560×10560=111513600× .7854=87582781-.44ft. area of 2 miles surface×$3\frac{1}{2}$ft. 306539735 +ft. *Ans.*

(5) First 9ft.=108in.×2ft. 3in. or 27in.=2916×8in. depth.=23328solid in.÷1728ft.=$13\frac{1}{2}$ft. *Ans.*

(6) First 6ft. length + 4ft. width =10× 2 = 20ft. length of the sides and ends× 3deep=60ft. to make the sides and ends; and 6×4=24ft. bottom; 60+24=84ft. of boards. *Ans.* Again 6ft. length.×4×3 depth= 72 solid feet in the box; 72ft.×1728in.=124416in.÷2150in. in a bushel =57bus. 3+pks. *Ans.*

(7) First 30 ro.× 30=900 rods, the area of the circumscribed square; then 30÷2=15×15=225 ×2=450 rods, the area of the inscribed square, by Case 8, Mensuration, page 149; 900—450= 450 rods, the difference of the squares; 900 ×.7854=706.86 rods, the area of the circle; 706.86 rods—450=256.86, the inscribed square less than the area; 900—706.86=193.14 rods; the circumscribed square more than the area.

PART II.

VULGAR FRACTIONS. (Arith. 155.)

CASE I.

NOTE.—C. M., Common Measure.

(2)
72)94(1
72
22)72(3
66
6)22(3
18
4)6(1
4
C. M. 2)4(2
4

$2)\frac{72}{94}=\frac{36}{47}$ *Ans.*

(3)
60)125(2
120
C. M. 5)60(12
60

$5)\frac{60}{125}=\frac{12}{25}$ *Ans.*

(4)
182)196(1
182
C. M. 14)182(13
14
42
42

$14)\frac{182}{196}=\frac{13}{14}$ *Ans.*

CASE II. (Arith. 155.)

(6)

$$\begin{array}{r|rrr} 3) & 6 & 8 & 9 \\ \hline 2) & 2 & 8 & 3 \\ \hline & 1 & 4 & 3 \\ \hline \end{array}$$

3×2×4×3=72 *Ans.*

(8)

$$\begin{array}{r|rrrrrrrrr} 2) & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ \hline 3) & 1 & 1 & 3 & 2 & 5 & 3 & 7 & 4 & 9 \\ \hline 2) & 1 & 1 & 1 & 2 & 5 & 1 & 7 & 4 & 3 \\ \hline & 1 & 1 & 1 & 1 & 5 & 1 & 7 & 2 & 3 \\ \hline \end{array}$$

2×3×2×5×7×2×3=2520 *Ans.*

(7)

$$\begin{array}{r|rrrr} 5) & 3 & 5 & 8 & 10 \\ \hline 2) & 3 & 1 & 8 & 2 \\ \hline & 3 & 1 & 4 & 1 \\ \hline \end{array}$$

5×2×3×4=120 *Ans.*

CASE III. (Arith. 156.)

(10)

$\frac{1}{2}, \frac{3}{4}, \frac{5}{8}$

$$\left.\begin{array}{r} 1\times4\times8=32 \\ 3\times2\times8=48 \\ 5\times2\times4=40 \end{array}\right\}\text{Numerators.}$$

$$2\times4\times8=64 \quad \text{Common denom.}$$

$\frac{32}{64}, \frac{48}{64}, \frac{40}{64}$ *Ans.*

(11)

$\frac{7}{8}, \frac{9}{10}, \frac{11}{12}$

$$\left.\begin{array}{r} 7\times10\times12=840 \\ 9\times\ 8\times12=864 \\ 11\times10\times\ 8=880 \end{array}\right\}\text{Numerators.}$$

$$8\times10\times12=960 \quad \text{Denominator.}$$

$\frac{840}{960}, \frac{864}{960}, \frac{880}{960}$ *Ans.*

(12)

$\frac{7}{8}, \frac{2}{3}, \frac{6}{7}, \frac{3}{5}$

$$\left.\begin{array}{r}7\times3\times7\times5=735\\2\times8\times7\times5=560\\6\times8\times3\times5=504\\3\times8\times3\times7=720\end{array}\right\}\text{Num.}$$

$$8\times3\times7\times5=840\ \text{Den'm.}$$

$\frac{735}{840}, \frac{560}{840}, \frac{540}{840}, \frac{720}{840}$ *Ans.*

(13)

$\frac{4}{5}, \frac{1}{2}, \frac{5}{6}, \frac{1}{4}$

$$\left.\begin{array}{r}4\times2\times6\times4=192\\1\times5\times6\times4=120\\5\times5\times2\times4=200\\1\times5\times2\times6=\ \ 60\end{array}\right\}\text{Num.}$$

$$5\times2\times6\times4=240\ \text{Den'm.}$$

$\frac{192}{240}, \frac{120}{240}, \frac{200}{240}, \frac{60}{240}$ *Ans.*

CASE IV. (Arith. 157.)

(15)

$$\begin{array}{r|rrr}2 & 2 & 4 & 8\\\hline 2 & 1 & 2 & 4\\\hline & 1 & 1 & 2\end{array}$$

$2\times2\times2=8$

$8\div2\times1=4$ 1st num.

$8\div4\times3=6$ 2d num.

$8\div8\times5=5$ 3d num.

$\frac{4}{8}, \frac{6}{8}, \frac{5}{8}$ *Ans.*

(16)

$$\begin{array}{r|rrr}4 & 8 & 10 & 12\\\hline 2 & 2 & 10 & 3\\\hline & 1 & 5 & 3\end{array}$$

$4\times2\times5\times3=120$

$120\div\ 8\times\ 7=105$ 1st num.

$120\div10\times\ 9=108$ 2d num.

$120\div12\times11=110$ 3d num.

$\frac{105}{120}, \frac{108}{120}, \frac{110}{120}$ *Ans.*

(17)

$$\begin{array}{r|rrrr}2 & 8 & 6 & 5 & 10\\\hline 5 & 4 & 3 & 5 & 5\\\hline & 4 & 3 & 1 & 1\end{array}$$

$2\times5\times4\times3=120$

$120\div\ 8\times7=105$

$120\div\ 6\times5=100$

$120\div\ 5\times4=\ \ 96$

$120\div10\times3=\ \ 36$

$\frac{105}{120}, \frac{100}{120}, \frac{96}{120}, \frac{36}{120}$ *Ans.*

(18)

$$\begin{array}{r|rrr}3 & 3 & 6 & 4\\\hline 2 & 1 & 2 & 4\\\hline & 1 & 1 & 2\end{array}$$

$3\times2\times2=12$

$12\div3\times2=\ \ 8$

$12\div6\times5=10$

$12\div4\times1=\ \ 3$

$\frac{8}{12}, \frac{10}{12}, \frac{3}{12}$ *Ans.*

CASE V. (Arith. 157.)

(20) $12\times17+15=219$ or $\frac{219}{17}$ *Ans.*

(21) $19\times18+12=354$ or $\frac{354}{18}$ *Ans.*

(22) $12\times5+4=64$ or $\frac{64}{5}$ *Ans.*

(23) $100\times56+19=5619$ or $\frac{5619}{56}$ *Ans.*

(24) $79\times19+12=1513$ or $\frac{1513}{19}$ *Ans.*

CASE VI. (Arith. 158.)

(26)
17)141(8
136
$\frac{5}{17}$

(27)
19)317(16
19
127
114
$\frac{13}{19}$

(28)
48)126(2
96
$\frac{30}{48}$

(29)
17)961(56
85
111
102
$\frac{9}{17}$

(30)
7)24(3
21
$\frac{3}{7}$

CASE VII. (Arith. 159.)

(32)

$\frac{2}{7}\times\frac{7}{8}\times\frac{8}{9}=\frac{112}{504}=\frac{2}{9}$ *Ans.*

or cancelled, thus,

$$\begin{array}{ccccccc} 2 & & \cancel{7} & & \cancel{8} & & \\ - & \times & - & \times & - & = & \frac{2}{9} \\ \cancel{7} & & \cancel{8} & & 9 & & \end{array}$$

(33)

$\frac{3}{4}\times\frac{5}{6}\times\frac{9}{10}=\frac{135}{240}=\frac{9}{16}$ *Ans.*

or cancelled, thus,

$$\begin{array}{ccccccc} \cancel{3} & & \cancel{5} & & 9 & & \\ - & \times & - & \times & — & = & \frac{9}{16} \\ 4 & & \cancel{6} & & \cancel{10} & & \\ & & 2 & & 2 & & \end{array}$$

(34)

$\frac{4}{5}\times\frac{5}{8}\times\frac{7}{9}=\frac{140}{360}=\frac{7}{18}$ *Ans.*

or cancelled, thus,

$$\begin{array}{ccccccc} \cancel{4} & & \cancel{5} & & 7 & & \\ - & \times & - & \times & - & = & \frac{7}{18} \\ \cancel{5} & & \cancel{8} & & 9 & & \\ & & 2 & & & & \end{array}$$

(35)

$\frac{12}{14}\times\frac{5}{6}\times\frac{1}{2}=\frac{60}{168}=\frac{5}{14}$ *Ans.*

or cancelled, thus,

$$\begin{array}{ccccccc} \cancel{2} & & & & & & \\ \cancel{12} & & 5 & & 1 & & \\ — & \times & - & \times & - & = & \frac{5}{14} \\ 14 & & \cancel{6} & & \cancel{2} & & \end{array}$$

(36)

$\frac{11}{12}\times\frac{13}{14}\times\frac{21}{29}=\frac{3003}{4872}=\frac{143}{232}$ *Ans.*

or cancelled, thus,

$$\begin{array}{ccccccc} & & & & \cancel{3} & & \\ 11 & & 13 & & \cancel{21} & & \\ — & \times & — & \times & — & = & \frac{143}{232} \\ \cancel{12} & & \cancel{14} & & 29 & & \\ 4 & & 2 & & & & \end{array}$$

CASE VIII. (Arith. 159.)

(38) $\frac{4}{5}\times\frac{}{12}\times\frac{}{20}=\frac{4}{1200}=\frac{1}{300}$ *Ans.*

(39) $\frac{1}{2}\times\frac{}{4}\times\frac{}{12}=\frac{1}{96}$ *Ans.*

(40) $\frac{5}{9}\times\frac{}{100}=\frac{5}{900}=\frac{1}{180}$ *Ans.*

(41) $\frac{8}{9}\times\ \frac{}{12}=\frac{8}{108}=\frac{2}{27}$ *Ans.*

(42) $\frac{6}{7}\times\frac{}{25}\times\frac{}{4}=\frac{6}{700}=\frac{3}{350}$ *Ans.*

(43) $\frac{9}{13}\times\frac{}{2}\times\frac{}{4}\times\frac{}{63}=\frac{9}{6552}=\frac{1}{728}$ *Ans.*

(44) $\frac{10}{11}\times\frac{}{60}\times\frac{}{24}=\frac{10}{15840}=\frac{1}{1584}$ *Ans.*

CASE IX. (Arith. 160.)

(46) $4\times20\times12=\frac{960}{1200}=\frac{4}{5}$ *Ans.*

(47) $1\times4\times12=\frac{48}{96}=\frac{1}{2}$ *Ans.*

(48) $1\times100=\frac{100}{180}=\frac{5}{9}$ *Ans.*

(49) $2\times12=\frac{24}{27}=\frac{8}{9}$ *Ans.*

(50) $3\times4\times25=\frac{300}{350}=\frac{6}{7}$ *Ans.*

(51) $1\times63\times4\times2=\frac{504}{728}=\frac{9}{13}$ *Ans.*

(52) $1\times24\times60=\frac{1440}{1584}=\frac{10}{11}$ *Ans.*

CASE X. (Arith. 161.)

(54)
3
100×
———
5)300
———
60 cts. *Ans.*

(55)
18
12
———
43)216(5$\frac{1}{43}$d.
215
———
$\frac{1}{43}$

(56)

	£	s.	
	5	9	
		6	
7)	32	14	
	£4	13	$5\frac{1}{7}$ *Ans.*

(57)

12
20×

78)240(3cwt.
234

6
4×

78)24(0qr.
25×

78)600(7lbs.
546

54
16×

78)864(11oz.
78

84
78

6
16×

78)96(1dr.
78

$\frac{18}{78}=\frac{3}{13}$

(58)

	C.	qr.	lb.	
	10	1	12	
			9	
11)	93	1	8	
	8	1	23	7oz. $4\frac{4}{11}$dr. *Ans.*

(59)
4
8×
—
7)32(4fur.
28
—
4
220×
—
7)880(125yds.
875
—
5
3×
—
7)15(2ft.
14
—
1
12×
—
7)12(1in.
7
—
5
3×
—
7)15(2b.c.
14
—
1
—
7

(60)
4
4×
—
5)16(3we.
15
—
1
7×
—
5)7(1day.
5
—
2
24×
—
5)48(9ho.
45
—
3
60×
—
5)180(36min.
180
—

CASE XI. (Arith. 161.)

(62)

£	s.	d.	pence.	
0	10	6	= 126	
			——	= $\frac{21}{40}$ £ *Ans.*
1	0	0	= 240	

(63)

s.	d.	qrs.	qrs.	
0	4	$\frac{1}{2}$	= 18	
			——	= $\frac{3}{8}$s *Ans.*
1	0	0	= 48	

(64)

lb.	oz.	dr.	dr.	
0	9	$2\frac{2}{7}$	= 1024	
			——	= $\frac{4}{7}$ *Ans.*
1	0	0	= 1792	

(65)

A.	r.	po.	po.	
0	1	30	= 70	
			——	= $\frac{7}{16}$ *Ans.*
1	0	0	= 160	

(66)

E.E.	qr.	na.	na.	
0	2	$3\frac{1}{9}$	= 100	
			——	= $\frac{5}{9}$ *Ans.*
1	0	0	= 180	

(67)

M.	fur.	po.	po.	
0	6	16	= 256	
			——	= $\frac{4}{5}$ *Ans.*
1	0	0	= 320	

(68)

mo.	w.	da.	ho.	min.	min.	
0	3	1	9	36	= 32256	
					——	= $\frac{4}{5}$ *Ans.*
1	0	0	0	0	= 40320	

PROMISCUOUS EXAMPLES. (Arith. 162.)

(69) $354 \div 18 = 19\frac{12}{18}$ *Ans.*

(70) $\frac{1}{2}, \frac{2}{3}, \frac{5}{6}, \frac{7}{8}$

$$\left.\begin{array}{l} 1\times3\times6\times8=144 \\ 2\times2\times6\times8=192 \\ 5\times2\times3\times8=240 \\ 7\times2\times3\times6=252 \end{array}\right\} \text{Numerators.}$$

$$2\times3\times6\times8=288 \quad \text{Denominators.}$$

$\frac{144}{288}$ $\frac{192}{288}$ $\frac{240}{288}$ $\frac{252}{288}$ *Ans.*

(71)

C. qr. lb. oz.

0 0 12 3 = 195

$\overline{\qquad} = \frac{39}{320}$ *Ans.*

1 0 0 0=1600

(72)

$\frac{3798}{7596} = \frac{1}{2}$ *Ans.*

(73)

$\frac{4}{5} \times \frac{11}{12} \times \frac{19}{25} = \frac{836}{1500}$ *Ans.*

(74)

3

8

— po. yds.

14)24 0 0

fur. 1 28 $3\frac{1}{2}$ *Ans.*

(75)

$12\times9+7=\frac{115}{9}$ *Ans.*

(76)

d. h. m. min.

0 7 12 =432

$\overline{\qquad} = \frac{3}{10}$ *Ans.*

1 0 0=1440

(77)

987)3969(4

3948

21)987(47

84

147

147

$$21\left\{\frac{987}{3969}=\frac{47}{189}\right. \textit{ Ans.}$$

(78)

$$\frac{5}{6},\frac{13}{5},\frac{4}{1}$$

$$\left.\begin{array}{r} 5\times5\times1=\ \ 25 \\ 13\times6\times1=\ \ 78 \\ 4\times6\times5=120 \end{array}\right\}\text{Num.}$$

$$6\times5\times1=\ \ 30\ \text{Denom.}$$

$\frac{25}{30}\ \frac{78}{30}\ \frac{120}{30}$ *Ans.*

(79)

$1362\div25=54\frac{12}{25}$ *Ans.*

(80)

$$\frac{\cancel{2}}{\cancel{3}}\times\frac{\cancel{6}}{\cancel{7}}\times\frac{\cancel{4}}{\cancel{5}}\times\frac{\cancel{5}}{\cancel{6}}\times\frac{\cancel{7}}{\underset{\cancel{2}}{\cancel{8}}}\times\frac{\overset{5}{\cancel{15}}}{16}=\frac{5}{16}\ \textit{Ans.}$$

(81)

s.
2
12
5)24 qr.
      0

4d. $3\frac{1}{5}$ *Ans.*

(82)

$\frac{13}{5}\times5+4=\frac{69}{5}$ *Ans.*

(83)

$$\begin{array}{r|rrrr} 2) & 6 & 10 & 4 & 5 \\ \hline 5) & 3 & 5 & 2 & 5 \\ \hline & 3 & 1 & 2 & 1 \end{array}\qquad 2\times5\times3\times2=60$$

$$\left.\begin{array}{r} 60\div\ \ 6\times5=50 \\ 60\div10\times7=42 \\ 60\div\ \ 4\times3=45 \\ 60\div\ \ 5\times4=48 \end{array}\right\}\frac{50}{60}\ \frac{42}{60}\ \frac{45}{60}\ \frac{48}{60}\ \textit{Ans.}$$

ADDITION OF VULGAR FRACTIONS. (Arith. 163.)

(2)

$\frac{2}{3}$ and $\frac{5}{7}$

$2\times7=14$
$3\times5=15$

$$\frac{29}{3\times7=21}=1\frac{8}{21}\ \textit{Ans.}$$

(3)

$\frac{3}{4}, \frac{2}{7}$, and $\frac{5}{6}$

$3\times7\times6=126$
$2\times4\times6=\ 48$
$5\times4\times7=140$

$$\frac{314}{4\times7\times6=168}=1\frac{146}{168}=1\frac{73}{84}\ \textit{Ans.}$$

(4)

$\frac{1}{5}, \frac{13}{3}$ and $\frac{2}{5}$ $\qquad 4\frac{1}{3}=\frac{13}{3}$

$1\times3\times5=\ 15$
$13\times5\times5=325$
$5\times3\times2=\ 30$

$$\frac{370}{5\times3\times5=75}=4\frac{70}{75}=\frac{14}{15}\ \textit{Ans.}$$

(5)

$\frac{2}{3}$ of $\frac{3}{4}=\frac{6}{12}=\frac{1}{2}$

$\frac{2}{7}, \frac{1}{2}$

$2\times2=4$
$1\times7=7$

$$\frac{11}{7\times2=14}\ \textit{Ans.}$$

(6)

First $\frac{1}{3}$ of $\frac{95}{1}=\frac{95}{3}$ and $\frac{7}{8}$ of $\frac{14}{1}=\frac{98}{8}$

Then $\frac{95}{3}, \frac{98}{8}$

$95\times8=760$
$98\times3=294$

$$\frac{1054}{3\times8=24}=43\frac{22}{24}=\frac{11}{12}\ \textit{Ans.}$$

(7)

$\frac{1}{2},\frac{2}{3},\frac{3}{4}$ fractions.

$$\begin{array}{rl} 1\times3\times4=12 & \left.\begin{array}{r}12\\3\\4\end{array}\right\}\text{whole numbers.} \\ 2\times2\times4=16 & \\ 3\times2\times3=18 & \\ \hline 46 & \end{array}$$

$$\frac{46}{2\times3\times4=24}=1\tfrac{11}{12}$$

$$20\tfrac{11}{12}\ \textit{Ans.}$$

(8)

First $\frac{1}{3}$ of $\frac{3}{4}=\frac{3}{12}$ or $\frac{1}{4}$

Then $\frac{5}{8},\frac{1}{2},\frac{1}{4}$

$$\begin{array}{rr} 5\times2\times4= & 40 \\ 1\times8\times4= & 32 \\ 1\times8\times2= & 16 \quad 7\ \text{whole number.} \\ \hline & 88 \end{array}$$

$$\frac{88}{8\times2\times4=64}=1\tfrac{24}{64}\text{ or }\tfrac{3}{8}$$

$$8\tfrac{3}{8}\ \textit{Ans.}$$

(9)

First $6\frac{7}{8}=\frac{55}{8}$ and $\frac{55}{8}$ of $\frac{9}{10}=\frac{495}{80}$ or $\frac{99}{16}$

and $\frac{4}{7}$ of $\frac{1}{2}=\frac{4}{14}$ or $\frac{2}{7}$

Then $\frac{99}{16},\frac{2}{7},\frac{1}{2}$

$$\begin{array}{rr} 99\times7\times2= & 1386 \\ 2\times16\times2= & 64 \\ 1\times16\times7= & 112 \quad 7 \\ \hline & 1562 \end{array}$$

$$\frac{1562}{16\times7\times2=224}=6\tfrac{109}{112}$$

$$13\tfrac{109}{112}\ \textit{Ans.}$$

(11)

	s.	d.
$\frac{7}{8}$ of a pound =	17	6
$\frac{3}{4}$ of a shilling =		9
s.	18	3 *Ans*:

(12)

	s.	d.	qr.
$\frac{1}{9}$ of a pound =	2	2	$2\frac{2}{3}$
$\frac{3}{4}$ of a penny =			3
s.	2	3	$1\frac{2}{3}$ *Ans*:

(13)

	oz.	dwt.	gr.
$\frac{1}{2}$lb. Troy =	6	0	0
$\frac{7}{12}$ of oz. =		11	16
	6	11	16 *Ans*:

(14)

	fur.	pol.
$\frac{3}{4}$ mile =	6	0
$\frac{7}{10}$ fur. =		28
	6	28 *Ans*.

(15)

	day.	ho.	min.
$\frac{1}{3}$ week =	2	8	0
$\frac{1}{4}$ day =		6	0
$\frac{1}{2}$ hour =			30
	2	14	30 *Ans*:

(16)

First $\frac{2}{7}$ of $\frac{15}{1}$£$=\frac{30}{7}$, $3\frac{3}{7}$£$=\frac{24}{7}$, and $\frac{1}{\cancel{3}}$ of $\frac{\cancel{5}}{7}$ of $\frac{\cancel{3}}{\cancel{5}}=\frac{1}{7}$£

Then $\frac{30}{7}+\frac{24}{7}+\frac{1}{7}=\frac{55}{7}$£$=$£7 17s. $1\frac{5}{7}$d.

$\frac{3}{7}$ of a shil.$=$ $5\frac{1}{7}$

£7 17 $6\frac{6}{7}$ *Ans.*

SUBTRACTION OF VULGAR FRACTIONS. (Arith. 164.)

(2)

$\frac{3}{7}$ $\frac{2}{5}$

$3\times5=15$

$2\times7=14$

$\dfrac{1}{7\times5=35}$ *Ans.*

(3)

$\frac{11}{12}$ $\frac{2}{3}$

$11\times3=33$

$12\times2=24$

$\dfrac{9}{12\times3=36}=\frac{1}{4}$ *Ans.*

(4)

$5\frac{2}{3}=\frac{17}{3}$ $\frac{9}{10}$

$17\times10=170$

$9\times3=27$

$\dfrac{143}{3\times10=30}=4\frac{23}{30}$ *Ans.*

(5)

$\frac{1}{7}$ of $\frac{2}{3}=\frac{2}{21}$

$\frac{19}{20}$ $\frac{2}{21}$

$19\times21=399$

$2\times20=40$

$\dfrac{359}{20\times21=420}$ *Ans.*

(6)

First $\frac{3}{9}$ of $\frac{76}{1}=\frac{228}{9}=\frac{76}{3}$

$\frac{9}{12}$ of $\frac{21}{1}=\frac{189}{12}=\frac{63}{4}$

Then $\frac{76}{3}$ $\frac{63}{4}$

$76\times4=304$

$63\times3=189$

$\dfrac{115}{3\times4=12}=9\frac{7}{12}$ *Ans.*

(7)

First $14\frac{1}{4}=\frac{57}{4}$ and $\frac{2}{3}$ of $\frac{19}{1}=\frac{38}{3}$

Then $\frac{57}{4}$ $\frac{38}{3}$

$$57\times3=171$$
$$38\times4=152$$

$$\frac{19}{4\times3=12}=1\tfrac{7}{12}\ \textit{Ans.}$$

(8)

	s.	d.
$\frac{1}{2}$ of a pound =	10	0
$\frac{3}{4}$ of a shilling =		9
s.	9	3 *Ans*

(9)

	d.	qrs.
$\frac{1}{2}$ of a shilling =	6	0
$\frac{3}{4}$ of a penny =		3
	5	$\frac{1}{4}$ *Ans.*

(10)

	dwt.	gr.
$\frac{3}{5}$ of an oz. =	12	0
$\frac{7}{8}$ of a dwt. =		21
	11	3 *Ans.*

(11)

	m.	fur.	po.
$\frac{2}{3}$ of a league =	2	0	0
$\frac{7}{10}$ of a mile =		5	24
	1	2	16 *Ans.*

(12)

	w.	d.	h.	min.	
	7	0	0	0	
$9\frac{7}{10}$ day=	1	2	16	48	
	5	4	7	12	*Ans.*

(13)

			£	s.	d.	
$5\frac{3}{8}$£	=		5	7	6	
$\frac{2}{7}$ of $\frac{28}{6}=\frac{56}{42}$	=	$\frac{4}{3}$£ =	1	6	8	
			£4	0	10	*Ans.*

MULTIPLICATION OF VULGAR FRACTIONS.

(Arith. 164.)

(2) $\frac{4}{9}\times\frac{2}{7}=\frac{8}{63}$ *Ans.*

(3) $\frac{4}{5}\times\frac{15}{16}=\frac{60}{80}=\frac{3}{4}$ *Ans.*

(4) $\frac{5}{7}\times\frac{9}{11}=\frac{45}{77}$ *Ans.*

(5) First $12\frac{3}{5}=\frac{63}{5}$; then $\frac{63}{5}\times\frac{7}{1}=\frac{441}{5}=88\frac{1}{5}$ *Ans.*

(6) $\frac{9}{2}\times\frac{1}{8}=\frac{9}{16}$ *Ans.*

(7) First $8\frac{2}{3}=\frac{26}{3}$, and $9\frac{3}{4}=\frac{39}{4}$;

Then $\frac{26}{3}\times\frac{39}{4}=\frac{1014}{12}=84\frac{6}{12}$ or $\frac{1}{2}$ *Ans.*

(8) $\frac{19}{2}\times\frac{1}{2}\times\frac{3}{4}=\frac{57}{16}=3\frac{9}{16}$ *Ans.*

(9) $\frac{1}{\cancel{2}}\times\frac{\cancel{2}}{\cancel{3}}\times\frac{\cancel{3}}{\cancel{4}}\times\frac{\cancel{4}}{\cancel{5}}\times\frac{\cancel{5}}{6}=\frac{1}{6}$ *Ans.*

(10) $\frac{1}{2}\times\frac{7}{1}\times\frac{3}{6}=\frac{21}{12}=1\frac{9}{12}$ or $\frac{3}{4}$ *Ans.*

(11) $\frac{\cancel{7}}{\cancel{3}}\times\frac{\cancel{8}}{\cancel{7}}\times\frac{1}{\cancel{2}}\times\frac{\cancel{3}}{\cancel{4}}\times\frac{2}{3}=\frac{2}{3}$ *Ans.*

DIVISION OF VULGAR FRACTIONS. (Arith. 165.)

(2) $\frac{4}{7}$ by $\frac{2}{3}$ or $\frac{4}{7}\times\frac{3}{2}=\frac{12}{14}=\frac{6}{7}$ *Ans.*

(3) $\frac{13}{19}\div\frac{7}{9}$ or $\frac{13}{19}\times\frac{9}{7}=\frac{117}{133}$ *Ans.*

(4) $\frac{14}{18}\div\frac{7}{10}$ or $\frac{14}{18}\times\frac{10}{7}=\frac{140}{126}=1\frac{14}{126}=\frac{1}{9}$ *Ans.*

(5) $\frac{3}{2}\div\frac{48}{10}$ or $\frac{3}{2}\times\frac{10}{48}=\frac{30}{96}=\frac{5}{16}$ *Ans.*

(6) $\frac{19}{6}\div\frac{19}{2}$ or $\frac{19}{6}\times\frac{2}{19}=\frac{38}{114}=\frac{1}{3}$ *Ans.*

(7) $\frac{7}{8}\div\frac{4}{1}$ or $\frac{7}{8}\times\frac{1}{4}=\frac{7}{32}$ *Ans.*

(8) $\frac{4}{1}\div\frac{7}{8}$ or $\frac{4}{1}\times\frac{8}{7}=\frac{32}{7}=4\frac{4}{7}$ *Ans.*

(9) First $4\frac{5}{9}=\frac{41}{9}$, and $\frac{5}{9}$ of $\frac{4}{1}=\frac{20}{9}$;
then $\frac{41}{9}\div\frac{20}{9}$ or $\frac{41}{9}\times\frac{9}{20}=\frac{369}{180}=2\frac{1}{20}$ *Ans.*

(10) First $\frac{5}{9}$ of $\frac{4}{1}=\frac{20}{9}$, and $4\frac{5}{9}=\frac{41}{9}$;
then $\frac{20}{9}\div\frac{41}{9}$ or $\frac{20}{9}\times\frac{9}{41}=\frac{180}{369}=\frac{20}{41}$ *Ans.*

PROMISCUOUS EXAMPLES. (Arith. 165.)

(1)

$$\frac{3}{\cancel{5}}\times\frac{\cancel{8}}{1}\times\frac{7}{\cancel{8}}\times\frac{\cancel{5}}{1}=21 \textit{ Ans.}$$

(2)

First $5\frac{1}{2}=\frac{11}{2}$; then $\frac{7}{8}$ of $\frac{11}{2}=\frac{77}{16}$

$$\frac{2}{5},\frac{9}{10},\frac{77}{16}$$

$$\begin{aligned} 2\times10\times16&=\ 320\\ 9\times\ 5\times16&=\ 720\\ 77\times\ 5\times10&=3850\\ &\overline{4890}\\ \frac{4890}{5\times10\times16=800}&=6\frac{9}{80} \end{aligned}$$

(3)

First $5205\frac{1}{5}=\frac{26026}{5}$, and $\frac{4}{5}$ of $\frac{91}{1}=\frac{364}{5}$;
Then $\frac{26026}{5}\times\frac{5}{364}=71\frac{1}{2}$

(4)

$\frac{37}{80}, \frac{111}{240}$

$$\frac{37\times240=8880}{111\times\ 80=8880}=0 \text{ Ans.}$$

(5)

	C.	qr.	lb.	oz.
$\frac{4}{7}$ ton =	11	1	17	$13\frac{5}{7}$
$\frac{9}{10}$ cwt. =		3	15	
	12	1	7	$13\frac{5}{7}$ *Ans.*

(6)

$$\frac{\cancel{3}}{\cancel{5}}\times\frac{\cancel{16}}{\cancel{3}}\times\frac{\overset{2}{\cancel{8}}}{\cancel{11}}\times\frac{\cancel{11}}{\underset{3}{\cancel{12}}}\times\frac{\cancel{5}}{\cancel{16}}=\frac{2}{3}$$

(7)

	s.	d.
$\frac{1}{4}$ £ =	5	0
$\frac{9}{10}$ s. =		$10\frac{4}{5}$
	4	$1\frac{1}{5}$ *Ans.*

(8)

$$\frac{1}{\cancel{2}}\times\frac{1}{\cancel{4}}\times\frac{2}{3}\times\frac{\overset{4}{\cancel{8}}}{1}\times\frac{\cancel{4}}{3}=\frac{8}{9} \text{ Ans.}$$

SINGLE RULE OF THREE. (Arith. 166.)

(2) As $\frac{1}{4}$yd. : $\frac{7}{8}$: : $\$\frac{2}{3}$;

Then $$\frac{\cancel{4}}{1}\times\frac{7}{\underset{\cancel{2}}{\cancel{8}}}\times\frac{\cancel{2}}{3}=\frac{7}{3}=\$2.33\tfrac{1}{3} \text{ Ans.}$$

(3) As $\frac{3}{5}$yd. : $40\frac{3}{4} = \frac{163}{4}$: : $\$\frac{7}{8}$;

$$\text{Then } \frac{5}{3} \times \frac{163}{4} \times \frac{7}{8} = \frac{5705}{96} = \$59.42\tfrac{17}{24}\ \textit{Ans.}$$

(4) As $\frac{3}{4}$yd. : $\frac{9}{2}$yd. : : $\frac{5}{3}$yd. ;

$$\text{Then } \frac{\overset{2}{\cancel{4}}}{\cancel{3}} \times \frac{\cancel{9}}{\cancel{2}} \times \frac{5}{\cancel{3}} = 10\text{yds. } \textit{Ans.}$$

(5) As $\frac{3}{4}$yd. : $\frac{31}{3}$yd. : : $\frac{587}{8}$;

$$\text{Then } \frac{\cancel{4}}{3} \times \frac{31}{3} \times \frac{587}{\underset{2}{\cancel{8}}} = \frac{18197}{18} = \$10.109+\ \textit{Ans.}$$

(6) As $\frac{1}{1}$lb. : $\frac{41}{9}$lb. : : $\frac{61}{5}$cts. ;

$$\text{Then } \frac{1}{1} \times \frac{41}{9} \times \frac{61}{5} = \frac{2501}{45} = \$0.55\tfrac{26}{45}\ \textit{Ans.}$$

(7) As $\frac{12}{1}$ men : $\frac{16}{1}$ men : : $\frac{85}{3}$ days ;

$$\text{Then } \frac{1}{\underset{3}{\cancel{12}}} \times \frac{\overset{4}{\cancel{16}}}{1} \times \frac{85}{3} = \frac{340}{9} = 37\tfrac{7}{9}\text{ days. } \textit{Ans.}$$

(8) As $\$\frac{1}{1}$: $\$\frac{500}{1}$: : $\frac{283}{5}$d. ;

$$\text{Then } \frac{1}{1} \times \frac{\overset{100}{\cancel{500}}}{1} \times \frac{\overset{100}{283}}{\cancel{5}} = 28300\text{d.} \div 12 \div 20 = £117\ 18\text{s.}4\text{d}$$

(9) As $\frac{4}{3}$bus. : $\frac{17}{5}$bus. : : $\frac{119}{3}$cts.

$$\text{Then } \frac{\cancel{3}}{4} \times \frac{17}{5} \times \frac{119}{\cancel{3}} = \frac{2023}{20} = \$1.01\tfrac{3}{20}\ \textit{Ans.}$$

(10) As $20\frac{1}{8}=\frac{161}{8}$: $\$12\frac{1}{2}=\frac{25}{2}$: : $240\frac{1}{7}$ pieces$=\frac{1681}{7}$;

Then $\frac{\overset{4}{\cancel{8}}}{161}\times\frac{25}{\cancel{2}}\times\frac{1681}{7}=\frac{168100}{1127}=149\frac{177}{1127}$ pieces. *Ans.*

(11) First $\frac{2}{3}$ of $\$2.28=\frac{456}{3}=\frac{152}{1}$; now as $\frac{3}{5}$E.Eng. : $\frac{7}{1}$E.Eng. : : $\frac{152}{1}$;

Then $\frac{5}{3}\times\frac{7}{1}\times\frac{152}{1}=\frac{5320}{3}=\$17.73\frac{1}{3}$ *Ans.*

(12) First $\$1.87\frac{5}{8}=\frac{1501}{8}$; and $27\frac{3}{8}=\frac{219}{8}\times\frac{4}{1}$ pieces$=\frac{876}{8}=\frac{219}{2}$;

Now $\frac{1}{1}$yd. : $\frac{219}{2}$: : $\frac{1501}{8}$cts.;

Then $\frac{1}{1}\times\frac{219}{2}\times\frac{1501}{8}=\frac{328719}{16}=\$205.449$ *Ans.*

(13) First $\frac{1}{3}-\frac{1}{6}=\frac{3}{18}=\frac{1}{6}$; $\frac{1}{5}$ of $\frac{2}{1}=\frac{2}{5}$; $\frac{14}{1}-\frac{2}{5}=\frac{68}{5}$; $13\frac{1}{5}=\frac{66}{5}$;

Now as $\frac{1}{6}$lb. : $\frac{68}{5}$lb. : : $\frac{66}{5}$d.;

Then $\frac{6}{1}\times\frac{68}{5}\times\frac{66}{5}=\frac{26928}{25}$ pence$=$£4. 9s. $9\frac{3}{25}$d. *Ans.*

(14) First $3\frac{1}{2}=\frac{7}{2}\times\frac{7}{2}=\frac{49}{4}$; $1\frac{1}{2}=\frac{3}{2}\times\frac{3}{2}=\frac{9}{4}$; $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{49}{4}=\frac{49}{24}$;

Then as $\frac{49}{4}$lb. : $\frac{49}{24}$lb. : : $\frac{9}{4}$£;

$$\frac{\cancel{4}}{\cancel{49}}\times\frac{\cancel{49}}{\underset{8}{\cancel{24}}}\times\frac{\overset{3}{\cancel{9}}}{\cancel{4}}=\frac{3}{8}=\text{£0. 7s. 6d. } \textit{Ans.}$$

(15) As $\frac{17535}{1}$: $\frac{60120}{1}$: : $\frac{1}{8}$

$\frac{1}{17535}\times\frac{60120}{1}\times\frac{1}{8}=\frac{60120}{140280}=\frac{3}{7}$ *Ans.*

(16) First $\frac{3}{5}$ of $\frac{3}{4}=\frac{9}{20}$ as $\frac{9}{20}$ part : $\frac{1}{1}$ part : : $\frac{171}{1}$£;

Then $\frac{20}{9}\times\frac{171}{1}=\frac{3420}{9}=$£380 *Ans.*

(17) First $5\frac{8}{9}=\frac{53}{9}\times100=\frac{5300}{9}$lb.;
As $\frac{1}{1}$lb. : $\frac{5300}{9}$lb. : : $\frac{27}{4}$cts. $=\frac{143100}{36}$cts. val. of sugar.
Again $\frac{1300}{8}$cts. : $\frac{143100}{36}$cts. : : $\frac{1}{1}$lb.;

$$\frac{\overset{2}{\cancel{8}}}{1300}\times\frac{143100}{\underset{9}{\cancel{36}}}=\frac{286200}{11700}=24\text{lb. }7\tfrac{5}{13}\text{oz. } \textit{Ans.}$$

(18) As $\frac{2}{5}$ share : $\frac{17}{1}$ shares : : $\$\frac{548}{1}$;
Then

$$\frac{5}{2}\times\frac{17}{1}\times\frac{\overset{274}{\cancel{548}}}{1}=\$23290 \text{ value of the whole tr't.}$$

Again \$7 : \$23290 : : 1 acre : $3327\frac{1}{7}$ acres. *Ans.*

(19) First $48\frac{3}{5}$ acres $=\frac{243}{5}$; $\$37\frac{5}{8}=\frac{301}{8}$; $27\frac{5}{11}$ acres $=\frac{302}{11}$; $\$30\frac{4}{9}=\frac{274}{9}$; $\$49\frac{3}{7}=\frac{346}{7}$
As $\frac{1}{1}$ acre : $\frac{243}{5}$ acres : : $\$\frac{301}{8}=\$\frac{73143}{40}$ value of the whole.
As $\frac{1}{1}$ acre : $\frac{302}{11}$ acres : : $\$\frac{274}{9}=\frac{82748}{99}$ value of the part first sold.
Then $\frac{243}{5}$ acres $-\frac{302}{11}=\frac{1163}{55}$ acres not sold.
As $\frac{1}{1}$ acre : $\frac{1163}{55}$ acres : : $\frac{346}{7}=\frac{402398}{385}$ value of the part last sold.
Then $\$\frac{82748}{99}+\$\frac{402398}{385}=\$\frac{71695382}{38115}$ what the whole sold for.
Sold for $\$\frac{71695382}{38115}$ — Cost $\$\frac{73143}{40}=\$\frac{79969835}{1524600}=$ $\$52.45\frac{4565}{15246}$ gained. *Ans.*

DOUBLE RULE OF THREE. (Arith. 167.)

2) First $\$33\frac{1}{3}=\frac{100}{3}$; $10\frac{2}{3}$mo. $=\frac{32}{3}$; $\$6\frac{1}{4}=\frac{25}{4}$;

$$\left.\begin{array}{lcl}\text{Principal} & \frac{100}{1} : & \frac{600}{1} \\ \text{Interest} & \frac{100}{3} : & \frac{25}{4}\end{array}\right\} : : \frac{32}{3}\text{mo.}$$

Inverted and cancelled:

$$\frac{1}{\underset{\cancel{4}}{\cancel{100}}}\times\frac{\cancel{3}}{\cancel{100}}\ \frac{\overset{6}{\cancel{600}}}{1}\ \frac{\cancel{25}}{\cancel{4}}\ \frac{\overset{2}{\cancel{\overset{8}{\cancel{32}}}}}{\cancel{3}}=12\text{mo.}=1\text{yr. } \textit{Ans.}$$

(3) First $24\frac{5}{8}$yds. $= \frac{197}{8}$; $\$94\frac{1}{3} = \frac{283}{3}$; $115\frac{4}{9}$yds.$=\frac{1039}{9}$

$$\left.\begin{array}{lccc} \text{yards} & \frac{197}{8} & : & \frac{1039}{9} \\ \text{quarters} & \frac{7}{1} & : & \frac{5}{1} \end{array}\right\} \$\frac{283}{3}$$

Inverted and cancelled:

$$\frac{8}{197}\times\frac{1}{7}\times\frac{1039}{9}\times\frac{5}{1}\times\frac{283}{3}=\frac{11761480}{37233}=\$315.88+ \quad \textit{Ans.}$$

(4)

$$\left.\begin{array}{lccc} \text{men} & \frac{5}{1} & : & \frac{3}{1} \\ \text{acres} & \frac{31}{2} & : & \frac{339}{5} \end{array}\right\} :: \frac{25}{9}$$

Inverted and cancelled :

$$\frac{2}{31}\times\frac{1}{\cancel{5}}\times\frac{\cancel{3}}{1}\times\frac{\overset{113}{\cancel{339}}}{\cancel{5}}\times\frac{\cancel{25}}{\underset{\cancel{3}}{\cancel{9}}}=\frac{226}{31}=7 \text{ days } 6\frac{30}{31} \text{ hours. } \textit{Ans.}$$

(5)

$$\left.\begin{array}{lccc} \text{acres} & \frac{31}{2} & : & \frac{279}{4} \\ \text{days} & \frac{25}{4} & : & \frac{25}{9} \end{array}\right\} \frac{3}{1} \text{ men.}$$

Inverted and cancelled :

$$\frac{2}{\cancel{31}}\times\frac{\cancel{4}}{\cancel{25}}\times\frac{\overset{\cancel{31}}{\cancel{279}}}{\cancel{4}}\times\frac{\cancel{25}}{\cancel{9}}\times\frac{3}{1}=6 \text{ men. } \textit{Ans.}$$

ADDITION OF DECIMALS. (Arith. 169.)

(2)
118.213

(3)
942.9754

(4)
94.07

(5)
.15
126.5
650.17
940.113
611.2561
2328.1891

(6)
2.1
4.12
15.4
76.36
120.16
425.04
643.18

SUBTRACTION. (Arith. 169.)

(2)
8.764

(3)
711.9794

(4)
480.
245.0075
234.9925

(5)
.145
.09684
.04816

(6)
270.2
75.4075
194.7925

(7)
1.
.000001
.999999

MULTIPLICATION. (Arith. 170.)

(3)
37.9
46.5
1895
2274
1516
1762.35

(4)
2461
.0529
22149
4922
12305
130.1869

(5)
7.353
3.5
36765
22059
25.7355

(6)
4.001
.004
.016004

(7)
.00071
.121
71
142
71
.00008591

(8)
1.42
4.1
142
568
5.822

(9)
253.5
1.25
12675
5070
2535
$316.875

(10)
27.4
3.56
1644
1370
822
97.544 *Ans.*

(11)
375.3
.0675
18765
26271
22518
25.33275 *Ans.*

(12)
1.032
.00421
1032
2064
4128
.00434472 *Ans.*

(13)
.042
.8
.0336 *Ans.*

(14)
2.673
1.02
5346
2673
2.72646 *Ans.*

(15*)

DIVISION OF DECIMALS. (Arith. 171.)

(3)
38.5)19.25(.5
1925

(4)
64.25)234.70525(3.653
19275
41955
38550
34052
32125
19275
19275

(5)
44).16060(.365
132
286
264
220
220

(6)
4.4).16060(.0365
132
286
264
220
220

(7)
44).16060(.00365
132
286
264
220
220

(8)
.9)9.0(10
9.0

(9)
9).9(.1
9

(10)
.075)1.00120(13.34+
75
251
225
262
225
370
300
70+

(11)
6.5)173.55(26.7 *Ans.*
130
435
390
455
455

(12)
647)6.725800(.010395
647
2558
1941
6170
5823
3470
3235
235

(13)
1000)487.67
.48767

(15)
.008)6.00(750
56
40
40

(14)

.0084).833200(99.19
756
772
756
160
84
760
756
4

(16)

678).0008136(.0000012
678
1356
1356

REDUCTION OF DECIMALS. (Arith. 172.)

Case I.

(2)	(3)	(4)	(5)
4)1.00	2)1.0	4)3.00	25)1.00(.04
.25	.5	.75	1.00

(6)

```
3)1.00000
  -------
   .33333+
```

(8)

$$\frac{11}{\underset{7}{\cancel{14}}}\times\frac{\overset{5}{\cancel{10}}}{13}=\frac{55}{91}$$

```
91)55.000000(.604395
   546
   ---
    400
    364
    ---
     360
     273
     ---
      870
      819
      ---
       510
       455
       ---
        55+
```

(7)

```
26)5.000000(.192307+
   26
   --
   240
   234
   ---
     60
     52
     --
      80
      78
      --
       200
       182
       ---
        18+
```

(9)

```
3842)275.000000(.071577+
     26894
     -----
      6060
      3842
      ----
      22180
      19210
      -----
       29700
       26894
       -----
        28060
        26894
        -----
         1166+
```

CASE II. (Arith. 173.)

(11)

$$\begin{array}{r|l} 12 & 6.0 \\ \hline 20 & 7.500 \\ \hline & .375 \text{ Ans.} \end{array}$$

(12)

$$\begin{array}{r|l} 20 & 12.0 \\ \hline & .6 \text{ Ans.} \end{array}$$

(13)

$$\begin{array}{r|l} 4 & 3.0 \\ \hline 12 & 9.75 \\ \hline 20 & 15.812500 \\ \hline & .790625 \text{ Ans} \end{array}$$

(14)

$$\begin{array}{r|l} 10 & 3.0 \\ \hline 100 & 16.300 \\ \hline & .163 \text{ Ans.} \end{array}$$

(15)

$$\begin{array}{r|l} 100 & 56.00 \\ \hline & .56 \text{ Ans.} \end{array}$$

(16)

$$\begin{array}{r|l} 4 & 3.00 \\ \hline 12 & 7.75 \\ \hline 20 & 16.6458333 \\ \hline \multicolumn{2}{r}{£34.8322916+ \text{ Ans.}} \end{array}$$

(17)

$$\begin{array}{rr|l} \multirow{2}{*}{24\left\{\right.} & 6 & 12.00 \\ \hline & 4 & 2.00 \\ \hline & 20 & .500 \\ \hline & 12 & .025000 \\ \hline & & .002083+ \text{ Ans} \end{array}$$

(18)

$$\begin{array}{rr|l} 16\left\{\right. & 4 & 12 \\ \hline & 4 & 3.00 \\ \hline 16\left\{\right. & 4 & .75 \\ \hline & 4 & .187500 \\ \hline & & .046875 \text{ Ans.} \end{array}$$

(19)

$$\begin{array}{l} 25)14.00 \\ \hline 4)2.56 \\ \hline \quad .64 \text{ Ans.} \end{array}$$

(20)

$$\begin{array}{r|l} 2 & 1.00 \\ \cline{2-2} 4 & 2.500 \\ \cline{2-2} & .625 \textit{ Ans.} \\ \cline{2-2} \end{array}$$

(21)

$$\begin{array}{rr|l} & 4 & 1.00 \\ \cline{3-3} 32 & \left\{\begin{array}{r} 4 \\ 8 \end{array}\right. & \begin{array}{l} 2.25 \\ \hline .56250 \end{array} \\ \cline{3-3} & & .07031+ \textit{ Ans.} \\ \cline{3-3} \end{array}$$

(22)

$$\begin{array}{r|l} 4 & 2.0 \\ \cline{2-2} 4 & 3.50 \\ \cline{2-2} & .875 \textit{ Ans.} \\ \cline{2-2} \end{array}$$

(23)

$$\begin{array}{rr|l} & 60 & 7.00 \\ \cline{3-3} 24 & \left\{\begin{array}{r} 4 \\ 6 \end{array}\right. & \begin{array}{l} .11666 \\ \hline .02916 \end{array} \\ \cline{3-3} & & .00486+ \textit{ Ans.} \\ \cline{3-3} \end{array}$$

(24)

$$\begin{array}{l} 365)72.0000(.1972+ \textit{ Ans.} \\ \begin{array}{r} 365 \\ \hline 3550 \\ 3285 \\ \hline 2650 \\ 2555 \\ \hline 950 \\ 730 \\ \hline 220+ \\ \hline \end{array} \end{array}$$

(25)

365.25)52.000000(.1423+ *Ans.*
36525
154750
146100
86500
73050
134500
109575
24925+

(26)

4 | 3.0
12 | .750
.0625 *Ans.*

CASE III. (Arith. 174.)

(28)
$
.461
100
cts. 46.100
10
m. .1000

(29)
£
.75
20
s. 15.00

(30)
£
.85251
20
17.05020
12
.60240
4
2.40960

(31)
cwt.
.86
4
qrs. 3.44
25
lbs. 11.00

(32)
lb.
.7
12
oz. 8.4
20
dwt. 8.0

(33)
.71
4×
oz. 2.84
20×
dwt. 16.80
24×
gr. 19.20

(34)
day.
.761
24×
ho. 18.264
60×
mi. 15.840
60×
sec. 50.400

(35)
lea.
.67
3
mi. 2.01
8×
.08
40×
po. 3.20
5½×
yd. 1.10
3×
.30
12×
in. 3.60

(36)
bar.
.07
32
gal. 2.24
4
.96
2
pt. 1.92

(37)
E. E.
.4712
5
qr. 2.3560
4
na. 1.4240

(38)
Acres.
.3375
4
ro. 1.3500
40
pe. 14.0000

(39)

$$\begin{array}{rr}
 & \text{yr.} \\
 & .3 \\
 & 365\times \\ \hline
\text{da.} & 109.5 \\
 & 24 \\ \hline
\text{ho.} & 12.0 \\ \hline
\end{array}$$

(40)

$$\begin{array}{rrl}
 & \text{£} & \\
 & .48 & \\
 & 20 & \\ \hline
\text{s.} & 9.60 & \\
 & .16 & \text{s. add} \\ \hline
 & .76 & \\
 & 12\times & \\ \hline
\text{d.} & 9.12 & \\ \hline
\end{array}$$

(41)

$$\begin{array}{rrl}
 & \text{lb.} & \\
 & .17 & \\
 & 12 & \\ \hline
\text{oz.} & 2.04 & \\
 & 84 & \text{oz. add.} \\ \hline
 & .88 & \\
 & 20\times & \\ \hline
\text{dwt.} & 17.60 & \\
 & 24\times & \\ \hline
\text{gr.} & 14.40 & \\ \hline
\end{array}$$

(42)

$$\begin{array}{rrl}
 & \text{£} & \\
 & .17 & \\
 & 20 & \\ \hline
 & 3.40 & \\
 & .7 & \text{s. less.} \\ \hline
\text{s.} & 2.70 & \\
 & 12 & \\ \hline
\text{d.} & 8.40 & \\
 & 4 & \\ \hline
\text{qrs.} & 1.60 & \\ \hline
\end{array}$$

(43)

$$\begin{array}{rrl}
 & \text{days.} & \\
 & .41 & \\
 & 24\times & \\ \hline
\text{ho.} & 9.84 & \\
 & .16 & \text{ho. less.} \\ \hline
 & .68 & \\
 & 60\times & \\ \hline
\text{mi.} & 40.80 & \\
 & 60\times & \\ \hline
\text{sec.} & 48.00 & \\ \hline
\end{array}$$

SINGLE RULE OF THREE IN DECIMALS. (Arith. 175.)

(2) As 1.4lb. : 75.31lb. : : \$1.75 ; then $75.31\times1.75 =131.7925\div1.4=\$94.137\frac{7}{14}=\frac{1}{2}$ *Ans.*

(3) As 4mo. : 1.5 mo : : 16 men : 60 men. *Ans.*

(4) As 147.00lb. : 1.7lb. : : $10.05 : $\$0.116\frac{33}{147}$ *Ans.*

(5) As 8.4lb. : 4cwt. 2qr. 7.4lb.=457.4lb. × 3hhd.= 1372.2lb. : : $1.046 ; then 1372.2 × $1.046= 1435.3212÷8.4=$170.871+ *Ans.*

(6) As 1yd. : 21.5yds. × 3pie. = 64.5 : : $1.53 = $98.685 *Ans.*

(7) As 9.4ho. : 11.3ho. : : 35.2 days ; then 35.2 × 11.3 =397.76÷9.4=42.31+days. *Ans.*

(8) As 19yds. : 435.5yds. : : $25.75 ; then 435.5 × 25.75=11214.125÷19=$590.217+ *Ans.*

(9) First 5.8 tuns × 4=23.2hhds. × 63=1461.6gals. in all ; then 1461.6gals.−50.9gals. lost=1410.7gals. to sell : now say as 1410.7gals. : 1gal. : : $266 : $\$0.188\frac{7884}{14107}$ *Ans.*

(10) First 25.6ells. × 50.5cts.=$12.928 value of B's. linen ; then as 40.7yds. : 1yd. : : $12.928 : $\$.317\frac{261}{407}$ *Ans.*

(11) As 1lb. : 3cwt. 1.5qr.=337.5lb. : : 2.75s. ; then 337.5 × 2.75 = 928.125s.= £46 8s. 1$\frac{1}{2}$d. cost. Again £60 11s. 6d.−£46 8s. 1$\frac{1}{2}$d.=£14 3s. 4$\frac{1}{2}$d. *Ans.*

(12) First 320.5lb. × $0.2625=$84.13125 sold for.
320.5lb. × $ .245 =$78.5225 cost.
$5.60875 whole g'n
Then as $78.5225 : $100 : : $5.60875 : $\$7.142\frac{67305}{785225}$ *Ans.*

(13) As 3 men : 5men : : 40.5 days : 67.5 days. *Ans.*

(14) As 7.5in. : 12in. : : 12in. : 19.2in. *Ans.*

(15) As 11.75 poles : 1pole : : 160poles : 13.61+ poles. *Ans.*

(16) As 7.5mo. : 15mo. : : $450 : $900 *Ans.*

DOUBLE RULE OF THREE IN DECIMALS. (Arith. 176.)

$$\text{(2)}\quad \left.\begin{array}{lrcl}\text{persons} & 2 & : & 4\\ \text{day} & 1 & : & 10.5\end{array}\right\}::\$.50625$$

$$\text{Then}\ \frac{\$0.50625\times105\times\overset{2}{4}}{2\times1}=\$10.63125\ \textit{Ans.}$$

$$\text{(3)}\quad \left.\begin{array}{ll}\text{Interest} & \$15.24:6\\ \text{months} & 12.75:9.5\end{array}\right\}::\$76.5\ \text{principal.}$$

$$\frac{\overset{15.3}{\cancel{76.5}}\times\cancel{6}\times\overset{1.9}{\cancel{9.5}}}{\underset{2.54}{\cancel{15.24}}\times\underset{\underset{.51}{\cancel{2.55}}}{\cancel{12.75}}}$$

$$\text{Then}\ \frac{15.3\times1.9}{2.54\times.51}=\frac{29.0700}{1.2954}=\$22.44\tfrac{1224}{12954}\ \textit{Ans.}$$

$$\text{(4)}\quad \left.\begin{array}{lrcl}\text{oxen} & 12 & : & 24\\ \text{days} & 20 & : & 100\end{array}\right\}::16.25$$

$$\frac{16.25\times\overset{2}{\cancel{24}}\times\overset{5}{\cancel{100}}}{\cancel{12}\times\cancel{20}}=162.5\ \text{acres.}\ \textit{Ans.}$$

$$\text{(5)}\quad \left.\begin{array}{llcl}\text{long} & 22.5\text{ft.} & : & 45\text{ft.}\\ \text{wide} & 17.3 & : & 34.6\\ \text{deep} & 10.25 & : & 12.3\\ \text{hours} & 8.2 & : & 12.3\\ \text{men} & 9 & : & 6\end{array}\right\}::2.5\ \text{days.}$$

$$\frac{\overset{2}{\cancel{45}}\times\overset{2}{\cancel{34.6}}\times\overset{\overset{\cancel{2}}{\cancel{6}}}{\cancel{12.3}}\times\overset{3}{\cancel{12.3}}\times\overset{2}{\cancel{6}}\times\overset{.5}{\cancel{2.5}}}{\cancel{22.5}\times\cancel{17.3}\times\underset{\cancel{2.05}}{\cancel{10.25}}\times\underset{\cancel{4.1}}{\cancel{8.2}}\times\underset{\cancel{3}}{\cancel{9}}}$$

Then $2\times2\times3\times2\times.5=12.0$ days. *Ans.*

SINGLE POSITION. (Arith. 179.)

(2) Suppose $96
$\frac{1}{2}=48$
$\frac{1}{3}=32$
$\frac{1}{4}=24$
104
Then as 104 : 130 : : 96 : $120 *Ans.*

(3) Suppose C. paid $15
Then B. " $15\times4=60$
A. " $60\times3=180$
255
Then as 255 : 340 : : 15 : $20 C's share.
Again $20\times4=$ $80 B's, and $80\times3=$ $240 A's.

(4) Suppose A's. age= 24 years.
Then $1\frac{1}{2}\times24=36$ B's age.
$36+24=60\times2\frac{1}{10}=126$ C's. age
186
As 186 : 93 : : 24 : 12 A's. age;
$12\times1\frac{1}{2}=18$ B's. age;
$12+18=30\times2\frac{1}{10}=63$ C's. age.

(5) Suppose $20\times\frac{2}{5}=8\times7=56\times\frac{5}{7}=40\div3=13\frac{1}{3}$
As $13\frac{1}{3}$: 20 : : 20 : 30 *Ans.*

(6) Suppose the harness= $20
horse $20\times2=40$
chaise $60\times2=120$
180
As 180 : 270 : : 20 : $30 the harness.
$30\times2=60$ horse.
$30+60=90\times2=180$ chaise.

(7) Suppose in the flock at first 60 pigeons;
Then $\frac{1}{3}$ of 60=20−60=40 now in the flock;
$\frac{1}{2}$ of 40=20−40=20 in the flock;
$\frac{1}{5}$ of 20= 4
Now as 4 : 6 : : 60 : 90 pigeons *Ans.*

DOUBLE POSITION. (Arith. 180.)

(9) First suppose $200+$120=320 A's.
200−$ 80=120 B's.
Now 120×2=240 which should be the same as A's. 320; therefore, 320−240=80 error too much. Again suppose $230+120=350 A's.; then 230−80=150 B's. Now 150×2=300, which should be the same as A's. 350; therefore 350−300=50 second error too much. Hence (230×80) − (200×50) 18400−10000= 8400 difference of the products; and 80−50= 30 difference of the errors. Then 8400÷30= $280 *Ans.*

(10) First suppose 10 sheep ×$2.50=$25.00; then 28−10=18 lambs. Now 18 lambs×$1.50 =$27.00; to the value of the sheep $25+$27 the value of the lambs=$52; which is an error of 2 too little. Again suppose 15 sheep×$2.50 =$37.50; then 28−15=13 lambs. Now 13 lambs×$1.50=$19.50; to the val. of the sheep $37.50+$19.50 the value of the lambs=$57; which gives an error of 3 too much. Hence (15×2)+(10×3) 30+30=60 sum of the products; and 2+3=5 sum of the errors. Then 60÷5=12 sheep; and 28−12=16 lambs.

(11) First suppose the body 24 inches; then $\frac{1}{2}$ of 24=12+9=21 the tail; and 21 tail+9 head= 30 the body; but by the supposition, the body was 24, which makes an error of 6 too much. Again suppose the body 26 inches; then $\frac{1}{2}$ of 26 =13+9=22 tail; and 22 tail+9 head=31 the

body; this gives an error of 5 too much Hence (24×5)—(26×6) 156—120=36; and as 1 is the difference of the errors, the body is 36 inches; the ½ of 36=18+9=27 the tail. Now 36+27+9=72in.=6 feet *Ans.*

(12) First suppose he wrought 25 days×20cts.= $5.00; then 40—25=15 days idle×10=$1.50; now $5.00—$1.50=$3.50 due the workman; but according to the question he had due him $5.00 which gives an error of $1.50 too little. Again suppose he wrought 20 days×20=$4.00; then 40—20=20 days idle×10=$2.00; now $4.00—2.00=$2.00 due the workman; but he had $5.00 due him, which is an error of $3.00 too little. Hence (300×25)—(150×20) 7500 —3000 = 4500 difference of the products, and 300—150=150 the difference of the errors: Then 4500÷150=30 days wrought, and as he was there 40 days he must have been idle 10 days.

(13) First suppose oxen 8×$17.50=$140.00
8×2=16 cows×$12.50=$200.00
16×3=48 calves×$ 3.75=$180
$520

now $520—$325=195 error too much.
Again suppose 4 oxen ×$17.50=$ 70.00
4×2=8 cows ×$12.50=$100
8×3=24 calves× $3.75=$ 90
$260

now $325—$260=65 error too little; hence (195×4)+(65×8) 780 +520 = 1300 sum of products; and 195+65=260 sum of errors; then 1300÷260=5 oxen; and 5×2=10 cows; 10×3=30 calves.

(14) Suppose the first horse worth £20+50 saddle =70÷2=35 the value of the second horse; now to the value of the second horse 35+50 the saddle=85; this should have been the same as 3×20=60 or triple the value of the first horse, therefore 85—60=25 an error too much. Again suppose first horse £24+ 50 = 74÷2= 37 second horse+50=87; then 24×3=72 triple the first horse; now 87—72=15 second error too much: hence (24×25) — (20×15) 600—300=300 the difference of the products; and 25 —15=10 the difference of the errors. Therefore 300÷10=£30 value of the first horse; and 30+50=80÷2=40 value of the second horse.

(15) First suppose their incomes to be $450; then $\frac{1}{5}$ of $450=$90 A saves; and $450—90=360 A. spends annually; now 360+150 =510 B. spends annually; then $510 — 450 = $60 B. spends more than his income which × 8 years =$480 B. is in debt at the end of 8 years; but the question says $400 which gives an error of 80 too much. Again suppose $420 their income; then $\frac{1}{5}$ of 420=84; and 420—84=336 A. spends annually: 336+150=486—420=66 ×8=$528—400=128 error too much. Hence (450×128) — (420×80) 57600—33600=24000 difference of products; and 128—80=48 difference of errors. Now 24000÷48=$500 income; 500÷5=100 A. saves; 500—100=$400 A. spends; $400+150=550 B. spends.

(16) First suppose her 14 years old when married; then he would be 14×3=42 years old. Now 14+15=29 her age; and 42+15=57yrs.; and 29×2=58, but should have been 57; which gives an error of 1 too little. Again suppose her 10 years old, he would be 10×3=30; then

10+15=25 her age; 30+15=45 his age; but twice her age should be like his or 25×2=50 this should be 45, which gives an error of 5 too little. Hence (5 ×14)−(10×1) 70−10=60 difference of products; and 5−1=4 difference of errors. Therefore 60÷4=15 her age; and 15×3=45 his age.

INVOLUTION. (Arith. 182.)

(2)
7
7×
49
7×
343
7×
2401
7×
16807 *Ans.*

(3)
35
35×
1225
35×
6125
3675
42875 *Ans.*

(4)
3×3×3×3= 81
4×4×4×4=256

(5)
.029
.029×
.000841
.029×
.000024389
.029×
.000000707281
.029×
.000000020511149

(6)

5.03
5.03 ×

25.3009
5.03 ×

127.263527
5.03 ×

640.13554081
5.03 ×

3219.8817702743
5.03 ×

16196.005304479729 *Ans.*

SQUARE ROOT. (Arith. 184.)

(2)

1296(36 *Ans.*
9

66)396
396

(3)

$\dot{5}4\dot{9}9\dot{0}2\dot{5}$(2345 *Ans.*
4

43)149
129

464)2090
1856

4685)23425
23425

(4)

```
      .  .  . .
      74770609(8647 Ans.
      64
      ----
 166)1077
      996
      -----
  1724)8106
       6896
       ------
 17287)121009
       121009
       ------
```

(5)

```
      .  .  .  .  .  .  .  .
      368863.0000000000(607.34092+  Ans.
      36
      --
  1207)8863
       8449
       -----
  12143)41400
        36429
        ------
  121464)497100
         485856
         --------
 12146809)112440000
          109321281
          ---------
 121468182)311871900
           242936364
           ---------
            68935536+
           ---------
```

(6)

2.2710957000(1.50701+ *Ans.*

1

25)127

125

3007)21095

21049

301401)467000

301401

165599+

(7)

10.000000000000(3.162277+ *Ans.*

9

61)100

61

626)3900

3756

6322)14400

12644

63242)175600

126484

632447)4911600

4427129

6324547)48447100

44271829

4175271+

(8)

.0003272481(.01809 *Ans.*

1

28)227

224

3609)32481

32481

(9)
9712.693809(98.553 *Ans.*
81
188)1612
1504
1965)10869
9825
19705)104438
98525
197103)591309
591309

Application. (Arith. 184.)

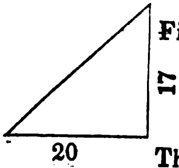
(10)
97×97=9409 *Ans.*

(11)
20736(144 *Ans.*
1
24)107
96
284)1136
1136

(12)
361(19 *Ans.*
1
29)261
261

(13)
484(22 *Ans.*
4
42)84
84

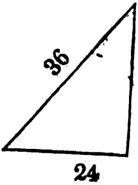
(14)



First 17×17=289
20×20=400
689

Then 689.0000(26.24 *Ans.*
4
46)289
276
522)1300
1044
5244)25600
20976
4624+

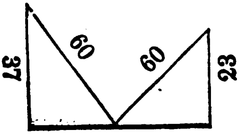
(15)



36×36=1296
24×24= 576
720

720.0000(26.83 *Ans.*
4
46)320
276
528)4400
4224
5363)17600
16089
1511

(16)



60×60=3600
37×37=1369

2231

2231.0000(47.23
16

87)631
609

942)2200
1884

9443)31600
28329

3271

3600
23×23= 529

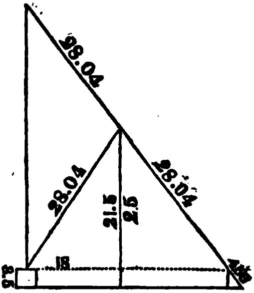
3071.0000(55.41
25 (47.23

105)571 102.64 *Ans.*
525

1104)4600
4416

11081)18400
11081

7319



(17) First 25−3.5=21.5 h'ht of the post above the top of the curb; then 21.5×21.5=462.25 and 18×18=324+462.25 = 786.25 the square root of which is 28.04 feet length of the upper part of the sweep. Again as 21.5 : 28.04 : : 3.5 : 4.56; now 28.04+28.04+4.56= 60.64 feet. *Ans.*

(19) First ¾=.75×.75=.5625; then say as 1ho. : 3ho. : : .5625 : 1.6875; $\sqrt[2]{1.6875}$=1.29+or 1.3 nearly.

(20) First 3.25 × 3.25 = 10.5625; 2.5×2.5=6.25; Then say 10.5625 : 6.25 : : 8ho. : 4ho. 44min. 1sec.+ *Ans.*

(21) First 3×3=9; then as 12ho. : 24ho. : : 9 : 18; $\sqrt[2]{18}$=4.242=4ft. 2.9in. *Ans.*

(22) First 1 acre=160 square rods ÷ 7854 = 203.7178577; then $\sqrt[2]{203.7178577}$= 14.2729 rods the diameter of the circle; and 14.2729 ÷ 7.1364 rods the length of the cord; then to get into feet×16½=117.7506ft.=117ft. 9in. *Ans.*

(23) First 150 acres×160 rods=24000 the square rods in 150 acres; now $\sqrt[2]{24000}$=154.91 rods the length of each side×4=619.64 the rods round the farm; and 619.64 rods×16.5 feet in a rod=10224.06 feet of fence: again 12ft.−2 =10ft. the length that 1 rail lays; then 10224.06÷10=1022.406 the number of rails to go round 1 rail high: therefore 1022.406 × 6 = 6134.43 rails. *Ans.*

CUBE ROOT. (Arith. 188.)

(2)

```
                                    ·  ·  ·    ·
                               122615327232(4968 Ans.
               4×4×4     =     64
1st def. divisor  4800         ─────
                  1161         58615
                  ────         53649
complete div.     5961         ───────
                    81           4966327
                  ─────          4374936
2d def. div.      720300         ─────────
                    8856            591391232
                  ──────            591391232
complete div.      729156           ─────────
                       36
                  ───────                       4
3d def. div.      73804800                      4
                    119104                      ─
                  ────────                      16
complete div.      73923904                      300
                  ────────                      ────
                                                4800
                                                ────

          4                    49               496
          3                     3                 3
        ───                  ────             ─────
        129                  1476             14888
          9                     6                 8
        ────                 ────            ──────
        1161                 8856            119104
        ────                 ────            ──────
```

(3)

```
                                 .  .  .  .
                              436036824287(7583 Ans.
                 7×7×7   =    343
1st. def. div.   14700        ------
                  1075         93036
                 ------        78875
complete div.    15775         -------
                    25          14161824
                 -------        13644512
2d. def. div.    1687500        ---------
                   18064          517312287
                 -------          517312287
complete div.    1705564          ---------
                      64
                 ---------                7
3d. def. div.    172369200                7
                     68229               ---
                 ---------               49
complete div.     1724374 29             300
                  ----------            -----
                                        14700
                                        -----

          7            75             758
          3             3               3
        ----          ----           -----
        215          2258            22743
          5             8                3
        ----          -----          -----
        1075         18064           68229
        ----         -----           -----
```

(4)

```
                                 259694072(638 Ans.
                    6×6×6 =      216
                                 ------
1st defective divisor 10800       43694
                        549       34047
                      -----      --------
     complete    do.  11349        9647072
                          9        9647072
                      -------      -------
2d defective     do.  1190700
                        15184
                      -------
     complete    do.  1205884
                      -------
           6          6            63
           6          3             3
          --         --          ----
          36        183          1898
          300         3             8
        -----        --          -----
        10800       549          15184
        -----       ---          -----
```

(5)

```
                               22069810125(2805 Ans.
              2×2×2     =      8
                               -----
1st def. div.     1200         14069
                   544         13952
                  ----         -----------
complete do.      1744           117810125
                    64           117810125
                  --------      ----------
2d def. div.      23520000
                     42025
                  --------
complete do.      23562025
```

(5 continued.)

2	2	280
2	3	3
4	68	8405
300	8	5
1200	544	42025

(6)

13929155106928543(240607 *Ans.*

2×2×2 = 8

1st def. div.	1200	5929
	256	5824
complete do.	1456	105155106
	16	103939416
2d def. do.	17280000	1215690928543
	43236	1215690928543
complete do.	17323236	
	36	
3d def. do.	173665080000	
	5052649	
complete do.	173670132649	

24060
3
721807
7
5052649

2	2	240
2	3	3
4	64	7206
300	4	6
1200	256	43236

(7) 171.467764060(5.555+ *Ans.*

	5×5×5	=	125
1st def. div.	7500		
	775		46467
			41375
complete do.	8275		
	25		5092764
			4578875
2d def. do.	907500		
	8275		513889060
			462453875
complete do.	915775		
	25		51435185
3d def. do.	92407500		
	83275		
complete do.	92490775		

5	5	55	555
5	3	3	3
25	155	1655	16655
300	5	5	5
7500	775	8275	83275

(8) .001906624(124 *Ans.*

	1×1×1	=	1
1st def. div.	300		
	64		906
			728
complete do.	364		
	4		178624
			178624
2d def. do.	43200		
	1456		
complete do.	44656		

(8 continued.)

1	1	12
300	3	3
300	32	364
	2	4
	64	1456

(9)

.150000000(.5313+ *Ans.*

5×5×5 = 125

1st def. div.	7500	25000
	459	23877
complete do.	7959	1123000
	9	844291
2d def. do.	842700	278709000
	1591	253908297
complete do.	844291	24800703
	1	
3d def. do.	84588300	
	47799	
complete do.	84636099	

5	5	53	531
5	3	3	3
25	153	1591	15933
300	3		3
7500	459		47799

(10)

		4.000000000000(1.5874+	
	1×1×1 =	1	*Ans.*
1st def. div.	300		
	175	3000	
		2375	
complete div.	475		
	25	625000	
		569312	
2d def. div.	67500		
	3664	55688000	
		52657003	
complete div.	71164		
	64	3030997000	
		3023044624	
3d def. div.	7489200		
	33229	7952376	
complete div.	7522429		
	49		1
			300
4th def. div.	755570700		
	190456		300
complete div.	755761156		

1	15	158	1587
3	3	3	3
35	458	4747	47614
5	8	7	4
175	3664	33229	190456

APPLICATION. (Arith. 189.)

(11)

$12 \times 12 \times 12 = 1728$ feet *Ans.*

(12)

		$10\dot{3}82\dot{3}(47$
	$4\times4\times4$ =	64
defective div.	4800	39823
	889	39823
complete do.	5689	

	4
4	3
4	127
16	7
300	889
4800	

(13)

$47\dot{4}55\dot{2}(78 \times 78 = 6084$ *Ans.*

	$7\times7\times7$ =	343
def. div.	14700	
	1744	131552
		131552
complete div.	16444	

7	7
7	3
49	218
300	8
14700	1744

(14)
£691 4s. = 13824(24 *Ans.*
2×2×2 = 8
defective divisor 1200
256 5824
5824
complete divisor 1456

2	2
2	3
4	64
300	4
1200	256

(15) First 8 in.×8×8=512; then as 32 : 48 : : 512 : 768; $\sqrt[3]{768.000000}$=9.15 ; and .1939125 remainder *Ans.*

(16) As 3×3×3=27 : 6×6×6=216 : : 4 lb. : 32lb. *Ans.*

(17) As 3×3×3=27 : 6×6×6=216 : : $150 : $1200 *Ans.*

(18) First 5 ft. 10 in.=70 in.; and 70×70×70=343000; 11 ft. 4 in.=136×136×136=2515456. Then as 343000 : 2515456 : : 175lb. Now 2515456×175 =440204800÷343000 = 1283.39 + *Ans.*

(19) First 12.9×12.9×12.9=2146.689×12bush.=25760.268; $\sqrt[3]{25760.268}$ = 29.5 and 87893 remainder *Ans.*

(20) First 5×5×5=125×3 times=375; now $\sqrt[3]{375}$ =7.21in. and .194639 remainder. Again as 5 : 7 : : 7.21in. : 10.09in. deep. *Ans.*

(21) First 6×6×6=216×2=432 ; now $\sqrt[3]{432}$= 7.55ft. and .1631125 remainder; then 6 : 8 :: 7.55 : 10.06+depth.

dimensions 1:2
time 50m.:45sec. } :: 1.75in.×1.75=3.0625

$$\frac{3.0625\times\overset{9}{\cancel{45}}\times 2}{\underset{10}{\cancel{50}}\times 1}=5.5125$$

5.5125(2.35 inches nearly. *Ans.*
4

43)151
129

465)2225
2325

ARITHMETICAL PROGRESSION. (Arith. 191.)

CASE I.

(2) 12+1 two extremes×12 num. of terms=156÷2=78 *Ans.*

(3) 16−1=15×4 com. diff.=60+5 first term=65d. or 5s. 5d. last term. Then 65+5=70 two ext. ×16 num. term=1120÷2=560=£2 6s. 8d.

(4) 100−1=99×12=1188+12 first term=1200 last term. Then 1200+12=1212 sum of extremes ×100=121200÷2=$606. *Ans*

(5) 100−1=99×4=396+4=400 last term. Then 400 +4=404×100=40400÷2=20200 = 11m. 3fur. 180yds. *Ans.*

(6) 1000×2=2000+2 two extremes=2002×1000=2002000÷2÷12=$834.16+ *Ans.*

(7) 100−1=99×4 com. diff. =396+5=401 last term. Then 401+5=406 two extremes×100 =40600÷2=$20300 *Ans.*

(8) First 160 acres×$60=$9600 the cost of the farm. Then 160−1=159×5 com. diff.=795 +2 first term=797 last term. Again 797+2= 799 two ext.×160=127840÷2=$63920 sold for; then $93920 ÷ 160 = $399.50 per acre; $63920−$9600=$54320 gain.

(9) 52−1=51×14 com. diff.=714+10 first term= $724 last term; then 724+10=734 sum of extremes×52=38168÷2= $190.84 whole debt *Ans.*

Case II. (Arith. 192.)

(10) $74−14=60 and 16−1=15; then 60÷15=4.

(11) $75−5=70 and 11−1=10; then 70÷10=7.

(12) 48−3=45 and 10−1=9; then 45÷9=5 years *Ans.*

(13) 79 − 4 = 75 and 16 − 1 = 15; then 75 ÷ 15 =5 mi. com. diff. Again 79+4=83×16=1328 ÷2=664 mi. distance.

GEOMETRICAL PROGRESSION. (Arith. 194.)

(2)

Powers	1	2	3	4	5
Ratio	2,	4,	8,	16,	32

32×

1024=10

1024×

1048576=20

1024×

1073741824=30

1

1073741823 less one.

2 first term.

12)2147483646

2[0)17895697[0 6

30)£8947848 10s. 6d. Am't.

£298261 12s. 4d. per bush.

} *Ans.*

(3)

In this question the ratio is the same as in the last; therefore take 1073741824=30

4×

4294967296=32

1 less one.

$42949672.95 *Ans.*

(4)

Powers	1	2	3	4
Ratio	4,	16,	64,	256

256×

65536=8

256×

16777216=12

1

4−1=3)16777215

$55924.05 sold.

14×12= 168

$55756.05 gained.

(5)

In this question the ratio is the same as in the 2d question; therefore 1024=10 term.

4×

4096=12

1 less one.

4095

1 guinea = 42 six pen.×

4s. 6d.=9)171990

$19110 *Ans.*

(6)

In this the ratio is again the same as in the second;
therefore 1048576=20
×32=5

33554432
1 less one.

33554431
×6 per.

201326586 *Ans.*
years 502−2=500÷20=25 num. terms.

(7)

In the table of Powers, page 182,
the 9 power of 7=40353607
and the 3 " of 7= 343×

13841287201=12 power.
1 less one.

7−1=6)13841287200

7680)2306881200

$$64\begin{cases}8)300375\frac{1200}{7680}\text{ pls.}\\ 8)\ 37546\end{cases}$$

4693

(8)

In this the ratio is the same as in the first question; therefore the 20 term=3486784401

10 term= 59049×

31381059609
13947137604
31381059609
17433922005

1[00)2058911320946[49=30 term.

$20589113209.46 am't.

30 yds. at $50 per yd. 1500

$20589111709.46 gained.

PERMUTATION. Arith. (195.)

(2) 1×2×3×4×5×6=720 *Ans.*

(3) 1×2×3×4×5×6×7×8×9=362880 *Ans.*

(4) 1×2×3×4×5×6×7×8=40320 positions;
Then 40320÷365=$110\frac{170}{365}$ years *Ans.*

COMBINATION. (Arith. 196.)

(2) $\dfrac{\overset{5}{\cancel{10}}\times\overset{3}{\cancel{9}}\times\overset{2}{\cancel{8}}\times 7\times\cancel{6}\times\cancel{5}}{1\times\cancel{2}\times\cancel{3}\times\cancel{4}\times\cancel{5}\times\cancel{6}}$ then 5×3×2×7=210 *Ans.*

(3)

$$\frac{\overset{\cancel{2}}{\cancel{24}}\times 23\times\overset{\cancel{2}}{\cancel{22}}\times\overset{7}{\cancel{21}}\times\overset{\cancel{2}}{\cancel{20}}\times 19\times\overset{\cancel{2}}{\cancel{18}}\times 17\times\overset{2}{\cancel{16}}\times\overset{\cancel{5}}{\cancel{15}}\times\overset{2}{\cancel{14}}\times 13}{1\quad\cancel{2}\quad\cancel{3}\quad\cancel{4}\quad\cancel{5}\quad\underset{\cancel{3}}{\cancel{6}}\quad\cancel{7}\quad\cancel{8}\quad\cancel{9}\quad\cancel{10}\quad\cancel{11}\quad\cancel{12}}$$

Then 23×19×17×13×7×2×2=2704156d.=
£11267 6s. 4d. *Ans.*

MULTIPLICATION OF DUODECIMALS.

(Arith. 198.)

CASE I.

(2)

ft. in.
9 : 7
3 : 6″
4 : 9 : 6
28 : 9
33 : 6 : 6 *Ans.*

(3)

ft. in.
3 : 11
9 : 5″
1 : 7 : 7
35 : 3
36 : 10 : 7 *Ans.*

(4)

ft. in.
8 : 6 : 9″ ‴ ⁗
7 : 3 : 8
5 : 8 : 6 : 0
2 : 1 : 8 : 3
59 : 11 : 3
62 : 6 : 7 : 9 : 0 *Ans.*

(5)

ft. in.
28 : 10 : 6″ ‴ ⁗
3 : 2 : 4
9 : 7 : 6 : 0
4 : 9 : 9 : 0
86 : 7 : 6
92 : 2 : 10 : 6 : 0 *Ans.*

CASE II. (Arith. 198.)

(7)

in. | | ft. in.
6 | ½ | 76 : 7 × 1
6 × 3 + 1 = 19
4 | ⅓ | 459 : 6
3
1378 : 6
76 : 7
38 : 3 : 6″
25 : 6 : 4
1518 : 10 : 10 *Ans.*

(8)

in.		ft. in.
2	$\frac{1}{6}$	84 : 3 × 5
		9 × 10 + 5 = 95
		758 : 3
		10
		7582 : 6
		421 : 3
		14 : 0 : 6″
		8017 : 9 : 6 *Ans.*

(9)

in.		ft. in.
3	$\frac{1}{4}$	84 : 7 : 11″ × 4
		8 × 9 + 4 = 76
″		
		677 : 3 : 4
		9
		6095 : 6 : 0
		338 : 7 : 8
9	$\frac{1}{4}$	21 : 1 : 11 : 9‴
		5 : 3 : 5 : 11 : 3⁗
		6460 : 7 : 1 : 8 : 3 *Ans.*

APPLICATION TO DUODECIMALS. (Arith. 198.)

(10)

ft.	in.	
3	3	
	9	
29	3	
	2	8″
19	6	0
58	6	
78ft. *Ans.*		

(11)

ft.	
24	
5	6′
12	0
120	
132	
4	
128)528	

cords 4$\frac{16}{128}$=$\frac{1}{8}$ *Ans.*

(12)

ft.	in.	
85	9	
	4	8′
57	2	0
343	0	
400	2	
	3	10′
333	5	8″.
1200	6	
128)1533	11	

11 cords 125ft. 11in.

(12 continued.)

ft.		
64	½	$3.75
		11×
32	½	41.25
16	½	1.875
8	½	9375
4	½	46875
1	¼	234375
in. 6	½	1171875
4	⅓	0292968
1	¼	0146484
		0097656
		.0024414
		$44.9389647 *Ans.*

(13)

ft.	in.	
3	3	
	9	
29	3	
	2	8′
19	6	0
58	6	
78		

As 128ft. : 78ft. : : $3.00 :
$1.82+ *Ans.*

(14)

ft.	in.	
2	8	
	2	4′
	10	8″
5	4	
6	2	8
		4
24	10	8
3	1	4
ft. 28	0	0

As 128ft. : 28ft. : : $4.375 :
$0.95 *Ans.*+

(15)

in.		ft.	in.		
4	⅓	9	10		
			3		
		29	6		
1	¼	3	3	4″	
			9	10	
in.					
6	½	33	7	2	
				2	9in.
		67	2	4	
3	½	16	9	7	
		8	4	9	6‴
		92	4	8	6

As 128ft.=1536in. : 92ft. 4in.=1108in. : : $7.00 to the *Ans.* $5.05+

(16)

		ft.	in.	
6	½	10	8	
			3	6in.
		32	0	
		5	4	
in.				
6	½	37	4	
			4	
4	⅓	149	4	
		18	8	
		12	5	
	128)	180	5	
		1c. 52ft.		

As 128ft : 180ft. : : $6⅝ : $9.31+*Ans.*

(17)

ft. in.
6 2
4
24 8
12
296

128
3
384
12
296)4608(15ft. 6in.+ *Ans.*
296
1648
1480
168
12
296)2016(6
1776
240

BOARDS AND PLANKS. (Arith. 199.)

(18)

ft. in.
13 8
1 10in.
11 4 8″
13 8
ft. 25 0 8 *Ans.*

(19)

ft. in.
14 3
1 5in.
5 11 3″
14 3
ft. 20 2 3 *Ans.*

(19)

(20)

ft. in.
13 9
10½
11 5 6″
6 10 6‴
ft. 12 0 4 6 *Ans.*

(21)

ft. in.
14 8
11in.
½)13 5 4″
2½
26 10 8
6 8 8
33 7 4 *Ans*

As 1000ft. : 33ft. : : $28 :
$.92 *Ans.*

(22)

ft. in.
½)16 6
11½in.
15 1 6″
8 3
15 9 9
3×5=15
47 5 3
5
237 2 3

ft.
¼)237
2¼cts.
474
59¼
$5.33¼ *Ans*

(23)

ft. in. ft. in.
57 8 13 0
6 × 7 = 42ft. 7in. 8½

346 0 8 8
7 6 6″

2422 prod of 42 ft. 9 2 6 in 1 plank
33 7 8″ 12

2455 7 8 110
12 12

29467 1326
12

353612 ÷ 1326 = 266$\frac{896}{1326}$ planks. *Ans.*

CLAPBOARDING OR SIDING. (Arith. 200.)

(24)

40 long 19.5 × 19.5 = 380.25
30 wide. 15 × 15 = 225

70 $\sqrt[2]{155.25}$ = 12.46 nearly.
2

140 circum.
16 ×

2240 12.46 × 15 = 186.90 × 2 = 373.80 feet in both gable ends; then 2240 + 373.80 2613.80; now 2613.80 × 144 = 376387.20 and 8ft. = 96in. × 4 = 384in. in one board: Again 376387.20 ÷ 384 = 980 + boards. *Ans.*

(25) First 40ft. long+32.5ft. wide=72.5ft.×2=145 circumference of the house; then 145×20=2900 square feet to the rafters; 21 rafters×21 =441; 32.5÷2=16.25×16.25=264.0625. Again 441−264.0625=176.9375 the sqr. root of which=13.3×16.25=216.125×2=432.25 square feet in both gable ends; now 2900+432.25=3332.25 square feet in the whole building on the outside. As the windows were of the same width 5ft. 9in.+4ft. 10in.=10ft. 7in. ×3ft. 6in. the width=37ft. 0in. 6″×14 windows =518 ft. 7in.; gable end windows 4ft.×2ft. 7 in.=10 ft. 4in. in each window×4 windows= 41ft. 4in. Now 518ft. 7in.+41ft. 4in.=559ft. 11in. the square feet in all the windows; 3332.25×144=479844 inches and 559ft. 11in. ×12×12=80628; 479844−80628=399216÷384 in. in 1 board=1039 boards. *Ans.*
As 144000 in. : 399216 in. : : $20 : $55.44+ cost. *Ans.*

(26) First 50 ft. long+38 wide=88×2=176 the circumference of building×18=3168 square feet to the rafters; then 25ft. rafters×25=625; ½ of 38=19×19=361; 625−361=$\sqrt[2]{264}$=16.24 perpendicular height of the roof; now 16.24× 19×2=617.12 square feet in the gable ends. Again 3168+617.12=3785.12 square feet on the outside of the building×144=545057.28 square inches: the board is 9in.−1¼in.=7¾, and 12 feet length of board×12×7½=1116 square inches in each board; then 545057÷1116=488 boards. *Ans.*
Again 488×9=4392×1¾cts.=$76.86. *Ans.* cost.

SHINGLING. (Arith. 201.)

(27) 55ft.×27=1485×2=2970 square feet in both roofs×144=427680 ÷ 22 square inches in a shingle=19440 shingles. *Ans.*

(28) 48+ 38 = 86×2=172×16⅓=2809.33 square feet to the rafters; 617.12 square feet in gable end, the same as in last question; each board contains 9.2083+ft.; now 2809.33+617.12= 3426.45 ÷ 9.2083 = 372+ boards, first *Ans.* Again 50×25×2=2500ft. of sheeting boards; 2500×144=360000÷20 inches in each shingle =18000 shingles; 360000÷24=15000 shingles.

(29) 693×4=2772×652=1807344÷2=903672sqr. feet to be covered with shingles × 144 = 130128768÷21in. in each shingle = 6196608 shingles. *Ans.*

693×693=480249 ÷ 43560 the square feet in 1 acre=11 acres 0roods 4 poles. *Ans.*

BRICK AND STONE. (Arith. 202.)

(30) 30yds. × 20yds.=600yds.×9=5400sqr. feet× 144=777600 sqr. in.÷32in. in the surface of 1 brick=24.300 bricks. *Ans.*

(31) 50ft.+40=90×2=180×12=2160in. in circum. 20in. thickness of the wall×4=80; now 2160 −80 = 2080 × 410in., the height=852800 × 20in. thickness of wall=17056000 solid inches in the wall÷80in. the number in 1 brick= 213.200 bricks. *Ans.*

(32) First 45ft.+32 = 77×2=154×12=1848.−80 in. 4 times the thickness of the walls=1768in. ×135in. the height of the first story=238680 ×20in. the width of the walls=4773600 the solid inches in the first story. Again 1848 the inches in the circumference of the building— 64in. 4 times the thickness of the walls of the

second story= 1784in.×120in. the height of the second story=214080×16in. the thickness of the wall=3425280 solid inches in the second story; 1848in.—48in. 4 times thickness of the walls=1800in.×100in. the height of the third story to the rafters = 180000 × 12in thickness of the walls=2160000 solid inches in the third story to the rafters. Again 21ft. ×21=441; and ½ of 32=16×16=256ft.; then 441—256 = 185 the square root of which is 13.6ft. the perpendicular height of the gable end; now 13.6×16×2=435.2 square feet in both gable ends×144in.=62668.8×12in. the thickness of the walls = 752025.6 the solid inches in both gable ends; now 4773600+ 3425280 + 2160000 + 752025.6 = 11110905.6 solid inches of the walls before deducting doors and windows. Again 8ft.×5½ft.=44× 2=88 the square feet in the 2 front doors; and 7ft.×5½ft.=38½×77 the square feet in the 2 back doors; now 88+77=165×144=23760 ×20 width of the walls=475200 solid inches in the 4 doors. Again 57 in. the height of the windows×44in. the width=2508in.×20 thickness of the walls=50160×12 the number of windows=601920solid inches in the windows of the first story; again 2508in. × 16in. the thickness of the walls=40128×16 number of windows in second story=642048 solid inches in the windows of the second story; again 2508 the square inches in each window×12 thickness of the walls=30096in.×20 windows =601920 the solid inches in the third story and gable ends; now 475200+601920+642048 +601920=2321088 the solid inches in all the doors and windows; now 11110905.6—2321088 =8789817.6 ÷ 80in. in 1 brick = 109.872+

bricks. *Ans.* Again as 1000 : $4.25 + 1.125= $5375 : : 109872 bricks : $590.562 expense. *Ans.*

(33) First 360ft.+300ft.=660×2=1320ft. the circumference of the garden×12=15840−16 in. four times the thickness of the wall=15824in. ×72 the height, and×4 the thickness=4557312 the solid inches of the brick-work on the outside of the wall, to the laying of bricks that cover the wall. Again 360ft.=4320in.−40in. what the inside of the wall is less than the outside=4280; and 300ft.=3600in.−40=3560+4280=7840×2=15680 the circumference of the inside of the wall−16in. four times the thickness of the wall=15664×72×4 the height and thickness=4511232 solid inches of brick-work on the inside of the wall. Again 360+300ft. = 660×2 = 1320 − 8ft. four times the thickness of the wall=1312×12=15744in.×24 width of the wall=377856×2½in. thickness of the bricks=944640 solid inches in the top of the wall; then 4557312+4511232+944640 =10013184÷80 inches in a brick=125164+ bricks *Ans.* Again 360ft.−8in.=359ft. 4in. one side of the part of the wall made of stone; 300ft. − 8in.=299ft. 4in. the other side; now 359ft. 4in.+299ft. 4in.=658ft. 8in. ×2=1317 ft. 4in. the circumference−5ft. 4in. four times the thickness of the wall=1312ft.×6ft. height =7872ft.×1ft. 4in. the thickness of the wall= 10496ft.÷30=349 cords 26ft. *Ans.*

(34) First 120ft.+85ft.=205×2=410 − 10ft.=400 ×31=12400×2½=31000 solid feet to the rafters; again 56ft. rafters×56=3136; ½ of 85= 42.5 × 42.5 = 1806.25 − 3136=$\sqrt[2]{1329.75}$= 36.46ft. perpendicular height of the roof; now

36.46 × 85 = 3099.1 × 2½=7747.7+31000= 38747.7 solid feet in the wall before deducting door and windows. Again 10ft.×7=70ft. the door; 12ft.×6½=78×16 windows=1248+70 =1318×2½=3295ft. solid content of door and windows; now 38747.7−3295=35452÷30= 1181 cords 22ft. stone. *Ans.* Again 124ft.× 56 = 6944 × 2 = 13888÷13=$1068\frac{4}{13}$ boards. *Ans.* Again 13888ft. × 144 = 1999872 ÷ 20= $99993\frac{3}{5}$ shingles. *Ans.*

(35) 1500 miles×5280 feet in a mile=7920000×30 ×20 the height and breadth=4752000000× 1728 solid inches in a foot=8211456000000÷ 80 = 102643200000 bricks. Again 20yrs.×7 months=140×4 weeks=560×6=3360×1500 bricks=504000 bricks lain by one man in twenty years. Then 102643200000÷504000=20365+ men *Ans.*

LATHING AND PLASTERING. (Arith. 203.)

(36) First 23ft. 7in.=283in.; and 20ft. 4in.=244in.; 10ft. 6in.=126in. Then 283+244=527in.×2 =1054in. distance round the room. Again 1054×126in. height=132804 square inches in the sides and ends; 283×244=69052 square inches overhead, and 132804+69052=201856 square inches in the sides and overhead. Now 66in.×42in.=2772in. in one window×5 windows=13860in.; 84in.×44in.=3696×3 doors =11088in. the doors; 66×60=3960in. fire-place; 3 doors 11ft.+5½ fire-place=16ft. 6in.; 43ft. 11in.×2=87ft. 10in.−16ft. 6in.=71ft. 4in. ×12=856in.×8in. mop-board=6848+13860+ 11088+3960=35756. Again 201856−35756= 166100÷84 inches one lath and the space between them=1977+lath *Ans.*

Then 166100÷1296in. in a square yd.=128.16 yds.×7=$8.9712 *Ans.*

(37) First 90ft.+60ft.=150×2=300ft.−10ft.=290 ft. × 30ft.=8700 square feet to the rafters; then 40ft. rafters×40=1600 and $\frac{1}{2}$ of 60=30 ×30=900 −1600 = $\sqrt{700}$ = 26.45ft. perpendicular height of the roof; now 26.45×60= 1587 square feet in both gable ends. Again 8700ft.+1587=10287 square feet in the walls; 10ft.×6ft. 7in.=65ft. 10in.×10=658ft. 4in. the square feet in the windows; then 10ft.×7ft.= 70ft. the door; 658ft. 4in.+70=728ft. 4in. the square feet in the door and windows. Again 10287ft.−728ft. 4in.=9558ft. 8in.×$2\frac{1}{2}$ft. thickness of the walls=23896÷30=$796\frac{16}{30}$ cords of stone *Ans.* Again 300ft. the circumference of the building×30ft. height=9000+1587=10587 −728=9859 square feet to be plastered÷9= 1095.4÷50yds. to a cask=21.9 casks for the outside *Ans.* Then 21.9 casks×$2.25=49.27 +cost of lime; and 1095.4 yards×10cts.= $109.54 plastering outside. Again 90ft.−6ft. =84ft. the length of the house on the inside, and 60ft.−6ft.=54ft. width on the inside. Now 84+54=138×2 = 276 circumference of the walls on the inside×30ft. the height=8280ft. Again 54×84=4536 square feet of room overhead; and 8280+4536 = 12816−728=12088 square feet to be plastered÷9=1343.11 yards ÷65=20.66+casks of lime. Again 20.66 casks ×$$2\frac{1}{4}$=$46.48+cost of lime; and 1343.11 yds. ×8cts.=$107.44+cost of lime. Again 12088 square feet×144=1740672 square inches÷72 inches in one lath=24176 lath *Ans.*

PROMISCUOUS QUESTIONS. (Arith. 204.)

(1) First 13cwt. 2qr.=1350lbs.×43cts.=\$580.50 value of the wool. Then \$580.50÷\$1.23= 471yds. 3qr.+ *Ans.*

(2) First 129$\frac{17}{27}$=$\frac{3500}{27}$; then as 5yds.: $\frac{3500}{27}$yds. :: \$7: \$$\frac{4900}{27}$ the cost of one bale. Again as $\frac{7}{1}$yds. : $\frac{3500}{27}$yds. : : \$11 : \$$\frac{5500}{27}$ sold for a bale; then \$$\frac{5500}{27}$−\$$\frac{4900}{27}$=\$$\frac{600}{27}$ gain on one bale. Now say as \$$\frac{600}{27}$: \$$\frac{200}{1}$: : $\frac{1}{1}$ bale : 9 bales *Ans.*

(3)

	26	16	14		
	13	4	7	24	60
yrs.	mo.	w.	da.	ho.	min.
14	0	0	0	0	0
11	11	11	11	11	11
1	11	3	2	12	49 *Ans.*

NOTE.—Always carry as many as the number of times you increase the denomination.

(4) Suppose the horse 6 parts, and the saddle 1 part=7 parts; then \$91÷7=\$13 saddle; and \$91−13=\$78 *Ans.*

(5) First $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}=\frac{6}{12}+\frac{4}{12}+\frac{3}{12}=\frac{13}{12}$
Then as \$$\frac{13}{12}$: \$$\frac{78}{1}$: : $\frac{1}{2}$: \$36 A's. proportion.
As \$$\frac{13}{12}$: \$$\frac{78}{1}$: : $\frac{1}{3}$: \$24 B's. do.
As \$$\frac{13}{12}$: \$$\frac{78}{1}$: : $\frac{1}{4}$: \$18 C's. do.

(6) First 4ft. length of pole=48in.÷2=24+6=30 inches the distance of one man from the weight, and 18in. will be the distance of the other man; then as 48 : 30 : : 250lb. : 156$\frac{1}{4}$lb.; and as 48 : 18 : : 250lb. : 93$\frac{3}{4}$lb. *Ans.*

(7) Length 7ft. 10in.=94.×46 in. breadth=4324in. ×50 inches depth=216200 solid inches in the bin÷2150in. a bushel=100$\frac{120}{215}$ bus. *Ans.*

(8) First \$210×3÷2=\$315 elder brother's portion ×3=945 half father's estate×2=\$1890 whole estate *Ans.*

(9) First 58−3=55÷(12−1)11=5yrs. *Ans.*

(10) As $2\frac{1}{2}$yrs.$=\frac{30}{1}$mo. : $\frac{35}{4}$: : \$$72\frac{4}{5}=\frac{364}{5}$: \$21.233 + *Ans.*

$$\left.\begin{array}{ll}\text{length } \frac{3}{4} : & \frac{5}{9} \\ \text{width } \frac{7}{8} : & \frac{21}{16}\end{array}\right\} : : \$\frac{2}{5}$$

Cancelled and inverted:

$$\frac{\cancel{4}}{\cancel{3}}\times\frac{\overset{2}{\cancel{8}}}{\cancel{7}}\times\frac{\cancel{5}}{9}\times\frac{\overset{\cancel{3}}{\cancel{21}}}{\underset{\cancel{4}}{\cancel{16}}}\times\frac{2}{\cancel{5}}=\frac{4}{9}\ \textit{Ans.}$$

(12) The amount of \$100 for 8mo. at 6 per cent. =\$104. Then as \$104 : \$416 : : \$100 : \$4.00 present worth; \$4.00−\$3.90=\$0.10. Again as \$4 : \$100 : : \$0.10 : $2\frac{1}{2}$ per cent. *Ans.*

(13)

First 15ap. 8pe. 16cts.×3=45ap. 24pe. 48cts.
9ap. 12pe. 15cts.×2=18ap. 24pe. 30cts.

27 18

$\frac{18}{27}=\frac{2}{3}$ct. ap. *Ans.*

Again 9ap. 12pe. 15cts.×5=45ap. 60pe. 75cts.
15ap. 8pe. 16cts.×3=45ap. 24pe. 48cts.

36 27

$\frac{27}{36}=\frac{3}{4}$ct. pe.

(14) First 70×4oz.=280oz. in one minute; and $\frac{1}{20}$ of 140lb. = 7lb. the whole blood of a man. Then as 280oz. : 7lb.=112oz. : : 1min. or 60sec. : 24sec. *Ans.*

(15) B. has $100 more than A., and C. has $164 more than A.; now B's. $100+C's. $164= $264−$1200 = $936 to be equally divided among the three; therefore $936÷3=312 A's., 312+100=412 B's. and 312+164=476 C's. *Ans.*

(16) $1250×4 children=5000+1780 widow's part =6780; now $126×25½yrs.=3213 cleared in trade. Again $6780−3213=$3567 *Ans.*

(17) First 40 poles in length and 4 poles in breadth make an acre; then 40×16½ft.=660ft.; and 4 ×16½ft.=66ft. Again 660×66 = 43560 the square feet in an acre, and 6×6=36 square feet for each tree; then 43560÷36=1210 trees *Ans.*

(18) First 240 days×20 quarts=4800 whole number of quarts ÷ 25 = 192lbs. of butter×15cts.= $28.80 value *Ans.*

(19) First as $100 : $105 : : $9.54 : $10.017 *Ans.* Again as $100 : $110 : : $9.54 : $10.49 the price of 100lbs.; $10.49÷100=$0.1049 *Ans.*

(20) First 5000ft. length of a mile×1000 breadth× 10 depth=50000000 solid feet in one mile of water×4 miles an hour=200000000. Again 5000ft. in a mile×5000×5000=125000000000; now by omitting eight ciphers in each, we have 1250÷2= 625 hours÷24=26da. 1ho. *Ans.*

(22) First suppose the work divided into 60 equal parts; then as 20 days : 1da. : : 60 parts : 3 parts done by A. and B.; as 12da. : 1da. : : 60 parts : 5 parts done by A., B., and C.; C. then in one day does two parts. Again as 2 parts : 60 parts : : 1da. : 30da. *Ans.*

(23) First suppose the work divided into 104 parts; then as 13 days : 1da. : : 104pts. : 8pts. done by A.; as 8da. : 1da. : : 104pts. : 13pts. done by A.

and B.; 13−8=5 parts done by B. in one day; as 5 parts : 104 parts : : 1da. : 20$\frac{4}{5}$da. *Ans.*

(24) First suppose the work divided into 315 parts; then as 15 days : 1 day : : 315 parts : 21 parts done by A. B. and C.; as 35da. : 1da. : : 315 parts : 9 parts done by A.; as 45da. : 1da. : : 315 parts : 7 parts done by B. From 21 parts−(9+7)16 parts=5 parts done by C. Again as 5 parts : 315 parts : : 1da. : 63da. *Ans.*

(25) Suppose the work divided into 360 parts; then as 8da. : 1da. : : 360 parts : 45 parts done by A. and B.; as 9da. : 1da. : : 360 parts : 40 parts done by A. and C.; as 10da. : 1da. : : 360 parts : 36 parts done by B. and C. Now 45+40+36 =121÷2=60$\frac{1}{2}$ parts done by A., B. and C.; then 60$\frac{1}{2}$−45=24$\frac{1}{2}$ A's.; 60$\frac{1}{2}$−40=20$\frac{1}{2}$ B's.; and 60$\frac{1}{2}$−36=15$\frac{1}{2}$ C's. As 24$\frac{1}{2}$ parts : 360 parts : : 1da. : 14$\frac{34}{49}$ A's.; as 20$\frac{1}{2}$ parts : 360 parts : : 1da. : 17$\frac{23}{41}$ B's.; as 15$\frac{1}{2}$ parts : 360 parts : : 1da. : 23$\frac{7}{31}$ C's.; as 60$\frac{1}{2}$ parts : 360 parts : : 1da. : 5$\frac{115}{121}$ A., B., and C's.

(26) Suppose the sheep divided into 8 parts; then as 1ho. : 1ho. : : 8 parts : 8 parts eaten by the dog in one hour; as $\frac{3}{4}$ho. : 1ho. : : 8 parts : 10$\frac{2}{3}$ parts eaten by the wolf in one hour; as $\frac{1}{2}$ho. : 1ho : : 8 parts : 16 parts eaten by the lion in one hour; $\frac{1}{2}$ho. : $\frac{1}{8}$ho. : : 8 parts : 2 parts eaten by the lion before the others begin. Now 8 parts−2 parts =6 parts to be eaten by the three together; 8 parts+10$\frac{2}{3}$+16=34$\frac{2}{3}$ parts eaten by the three in one hour. As 34$\frac{2}{3}$ parts : 6 parts : : 1ho. : $\frac{9}{52}$+ $\frac{1}{8}$ho. the lion ate alone=$\frac{124}{416}$=$\frac{31}{104}$ho. *Ans.*

(27) First suppose beer to be divided into 30 parts; as 15da. : 1da. : : 30 parts : 2 parts drank by the man and woman; 2 parts×9da.=18 parts drank by both in nine days; 30−18=12 parts re-

maining of the beer; as 12 parts : 30 parts : : 30 da. : 75da. the woman took to drink the whole; as 75da. : 1da. : : 30 parts : $\frac{30}{75}=\frac{2}{5}$ parts drank by the woman in one day; then 2 parts drank by both$-\frac{2}{5}$ drank by the woman$=\frac{8}{5}$ drank by the man in one day. Again $\frac{8}{5}$ parts : $\frac{30}{1}$ parts : : $\frac{1}{1}$da. : $18\frac{3}{4}$da. the man can drink the whole *Ans*

(28) 1×3=3 second weight×3=9 third weight×3 =27 fourth weight×3=81 the fourth weight. *Ans.*

(29) First $\frac{1}{2}+\frac{1}{4}+\frac{1}{6}=\frac{44}{48}$; then $\frac{48}{48}-\frac{44}{48}=\frac{4}{48}$=(60 peaches+40 pears)100; then as $\frac{4}{48}$: $\frac{1}{1}$: : 100 trees : 1200 trees *Ans.*

(30) See Case 5 Interest. First 2500×8 years= 20000; \$3500−2500=\$1000 interest; then 20000 : 100 : : 1000 : 5 per cent. *Ans.*

(31) First A. goes 7 miles in two hours, or $3\frac{1}{2}$ miles in one hour; then 59 miles$-3\frac{1}{2}=55\frac{1}{2}$ miles the distance between them when B. starts; $8\div3=2\frac{2}{3}$ miles B. travels in one hour; now $3\frac{1}{2}+2\frac{2}{3}=6\frac{1}{6}$ miles the distance travelled in one hour. Then as $6\frac{1}{6}$ miles$=\frac{37}{6}$: $55\frac{1}{2}=\frac{111}{2}$: : $3\frac{1}{2}=\frac{7}{2}$: $31\frac{1}{2}+3\frac{1}{2}=35$ miles A. travels; 59−35=24 miles B. travels *Ans.*

(32) First $5+3=8$ loaves$\div3=2\frac{2}{3}$lo. eaten by each person. A. brings 5lo., eats $2\frac{2}{3}$lo., and is to receive pay for $2\frac{1}{3}$lo. B. brings 3lo., eats $2\frac{2}{3}$lo., and receives pay for $\frac{1}{3}$ of a loaf; consequently A. is to receive pay for 7 thirds, and B. for 1 third; so A. must have 7 shillings, and B. 1 shilling *Ans.*

(33)

$$\left.\begin{array}{lll} \text{First } 3\text{yds.} & : 100\text{yds.} & : : 1\text{s.} : 33\text{s. } 4\text{d.} \\ 2 & : 100 & : : 1\text{s.} : 50\text{s.} \end{array}\right\} = 83\text{s. } 4\text{d. cost.}$$

5 : 200 : : 2s. : 80s. sold for.

Then 83s. 4d.−80s.=3s. 4d. lose *Ans.*

(34) First $\frac{1}{9}+\frac{5}{6}=\frac{51}{54}$; and $\frac{54}{54}-\frac{51}{54}=\frac{3}{54}$; then as 3 : 54 : : 12 : 216ft. *Ans.*

(36) 5+4=9 ; the 12 hours are to be divided into two parts, bearing the proportion of 5 and 4. Say as 9 : 4 : : 12 : 5ho. 20min. *Ans.*

(37) First 360deg.×69½=25020 miles÷20 miles= 1251.00÷365.25=3yrs. 155.25 days *Ans.*

(38) First 3oz. 17dwt. 10gr.=1858gr. in one pound sterling ; £900,000,000×1858=1672200000000 ÷7000=238885714$\frac{2}{7}$lbs.÷25÷4÷20 = 119442 tons 17cwt. 0qr. 14$\frac{2}{7}$lb. ; then 119442 tons 17cwt. 0qr.14$\frac{2}{7}$=119442.8562×3 rods=358328.5686÷ 40÷8 =1119 miles 6fur. 8 rods+. Again £900,000,000×\$4$\frac{4}{9}$ in one £ sterling=\$4,000,-000,000÷\$60 counted in 1 minute=66666666$\frac{2}{3}$ (= 40 sec.) minutes÷60=1111111ho. 6min. Now 365.25×12ho.=4383ho. ; then 1111111÷ 4383=253yrs. 2212 remainder÷12=184 days 4ho. *Ans.*

(39) First 12 weeks=84 days×14oz.×2000 soldiers =2352000oz. the whole quantity of bread ; then 105 barrels×200×16=336000oz. spoiled ; now 2352000−336000=2016000 ounces not spoiled. Again 84×2000=168000 days to be furnished with bread ; and 2016000÷168000=12oz. *Ans.*

(40) First 800 men×17 months=13600 product of men and time ;

800×4mo.=3200
800− 68= 732×5½ =4026
732+280=1012×3 =3036
1012−184= 828

Now 3200+4026+3036=10262. Again 13600 −10262=3338÷828=4$\frac{26}{828}$mo. ; and 4mo.+5½ or5$\frac{414}{828}$+3mo.+4$\frac{26}{828}$=16$\frac{440}{828}$=$\frac{110}{407}$mo. *Ans.*

(41) Suppose 2 for the first part, then the second part will be 5 ; say as 3 : 4 : : 5 : 6$\frac{2}{3}$ the third

part; and as $5 : 7 :: 6\frac{2}{3} : 9\frac{1}{3}$ the fourth part. Now $2+5+6\frac{2}{3}+9\frac{1}{3}=23$; then as $23 : 2 :: 276 : 24$ the first, and so of the other parts *Ans.*

(42) By Case 4 Vulgar Fractions, page 157, find the least common denominator of the fractions $\frac{1}{16}$, $\frac{3}{8}$, $\frac{3}{10}$, $\frac{3}{20}$, which will be $\frac{5}{80}$, $\frac{30}{80}$, $\frac{24}{80}$, $\frac{12}{80}$; these numerators with the 9 give the *Ans.*

(43) First $\frac{18}{18}-\frac{7}{18}=\frac{11}{18}\times\frac{7}{18}=\frac{77}{324}$ the 2d son's portion. Then $\frac{7}{18}-\frac{77}{324}=\frac{882}{5832}$ the difference of the son's portions.

$\frac{7}{18}+\frac{77}{324}=\frac{3654}{5832}$ both sons' portions.
$\frac{3654}{5832}-\frac{18}{18}=\frac{2178}{5832}$ widow's portion.
Now say as $\frac{882}{5832} : \$\frac{61720}{1} :: \frac{2178}{5832} : \$1524.10\frac{30}{49}$ *Ans.*

(44) First 3 miles $\times 3 = 9 \times .7854 = 7.0686 \times 640$ acres in one square mile $= 4523.904$ acres. *Ans.*

(45) First $63\times 12\times 12=9072$ solid feet $\times 3=27216$; then say as 1 cubic foot : 27216 :: 1000oz. : 27216000oz. ÷ 16oz. ÷ 100lb. ÷ 20cwt. $= 850\frac{1}{2}$ tons.

(46)
$$\left.\begin{array}{lrcr} \text{cents} & 74 & : & 54 \\ \text{barrels} & 108 & : & 90 \\ \text{miles} & 63 & : & 148 \end{array}\right\} :: 189 \text{ bushels.}$$

$$\frac{\cancel{54}\times\overset{10}{\cancel{90}}\times\overset{\cancel{2}}{\cancel{148}}\times\overset{27}{\cancel{189}}}{\cancel{74}\times\underset{\cancel{2}}{\cancel{108}}\times\underset{\cancel{7}}{\cancel{63}}}=270 \text{ bushels. } \textit{Ans.}$$

(47) First $850+ $5750+600=$7200; $7200\div\frac{1}{3}=$ $2400 A's.; $7200\div\frac{1}{4}=$ $1800 B's.; $7200\div\frac{1}{5}=$ 1440 C's.; now $2400+1800+1440=5640-7200=1560$ D's. Again A's. labor with 2 apprentices = $144; B's. labor with 3 journeymen = $344; C's. labor with 1 journeyman and 2 apprentices = $180; D's. labor with 1 journeyman and 2 apprentices = $380; now A. paid $2400

+ labor 144=$2544; B. paid $1800 + labor $344=$2144; C. paid $1440+ labor $180= 1620; D. paid $1560 + labor $380=$1940. Again, the lot, materials, mason-work, and painting, $7200 + all the labor $1048+gain $2000=$10248 to be divided among the 4 carpenters. Now A. contributed in money and labor $2544+B.$2144+C. $1620+D. 1940= $8248.

now as 8248 : 2544 : : 10248 : $3160.87+ A. rec.
8248 : 2144 : : 10248 : $2663.88+ B. do.
8248 : 1620 : : 10248 : $2012.82+ C. do.
8284 : 1940 : : 10248 : $2410.41+D. do.

(48) First 18 cwt.×$7=$126 sugar sold for;18cwt. ×$5=$90 sugar worth; then $126—90=$36 A. gained : ⅓ of 126=42—126=$84 to pay in paper;then say as $2.50 : $0.50 : : $84 : $16.80 B's. gain ; A's. gain $36—B's. gain $16.80= $19.20 *Ans.*

(49) First ⅜ of 11s.=4s. 1½d.; and 11s.—4s. 1½d.= 6s. 10½d. cost a thousand. Again 13s. 6d.— 6s. 10½d.=6s. 7½d. gained by selling at the last price. Now as 6s. 10½d. : 6s. 7½d. : : £100 : £96 7s. 3$\frac{3}{11}$d. *Ans.*

(50) First suppose $300÷2=150—50=$100 F's. part; $300÷3=$100 G's. part; now F's. $100 +G's. $100, and + H's. which was $10 less than G's., or $90=$290 — $300=10 error. Again suppose $330÷2=$165—50=115; and $330÷3=110; then F's. $115+G's. $110+ H's. $100=$325—330=5 error. Now (330× 10)—(300×5) 3300—1500=1800 the difference of the products; and 10—5=5 difference of errors; 1800÷5=$360 whole estate. Then 360÷2=180—50=$130 F's. part; 360÷3= $120 G's. part; and H's. will be $110 *Ans.*

(51) First 7 B's. : 5 B's. : : 3 C's. : 2$\frac{1}{7}$ C's.; then A's.

9+B's. 5+C's. $2\frac{1}{7}=16\frac{1}{7}$ sum; say as $2\frac{1}{7}$ C's.: $16\frac{1}{7}$ sum : : £2584 : £19466 2s. 8d. *Ans.*

(52) First John $\frac{100}{170}$, James $\frac{100}{135}$ reduced to a common denominator will be $\frac{13500}{22950}$, $\frac{17000}{22950}$, which added make $\frac{30500}{22950}$. Now as $\frac{30500}{22950}:\frac{13500}{22950}$: : \$10000 : $\$4426\frac{14}{61}$ John's share; as $\frac{30500}{22950}:\frac{17000}{22950}$: : \$10.000 : $\$5573\frac{47}{61}$ James' share.

(53) $\frac{100}{121}$, $\frac{100}{128}$, $\frac{100}{135}$ reduced to a common denominator are $\frac{1728000}{2090880}$, $\frac{1633500}{2090880}$, $\frac{1548800}{2090880}$, which added make $\frac{4910300}{2090880}$; then say as $\frac{4910300}{2090880}:\frac{1728000}{2090880}$: : \$ 10.000 : $\$\,3519.133\frac{12301}{49103}$; as $\frac{4910300}{2090880}:\frac{1633500}{2090880}$: : \$10.000 : $\$3326.680\frac{31960}{49103}$; as $\frac{4910300}{2090880}:\frac{1548800}{2090880}$: : \$10.000 : $\$3154.186\frac{4842}{49103}$.

(54) First $\frac{2}{9}+\frac{2}{7}=\frac{32}{63}$; and $\frac{63}{63}-\frac{32}{63}=\frac{31}{63}$ C's. part.
as $\frac{31}{63}:\frac{2}{9}$: : \$200 : $\$90\frac{10}{31}$ A's.
as $\frac{31}{63}:\frac{2}{7}$: : \$200 : $\$116\frac{4}{31}$ B's.

(55) First suppose 20lbs. of butter; then $\frac{3}{5}$ of 20= 12lbs. lard; 20+12=32÷4=8doz. eggs; now 20lbs. butter×25cts.=\$5.00; 12lbs. lard×20 cts.=\$2.40; and 8doz. eggs×15=1.20. Again \$5.00+\$2.40+\$1.20=\$8.60−\$12.90=\$4.30 error. Second suppose 25lbs. butter; then $\frac{3}{5}$ of 25=15lbs. lard; 25+15=40÷4=10doz. eggs; and 25lbs. butter×25=\$6.25; 15lbs. lard×20 cts.=\$3.00; and 10doz. eggs×15cts.=\$1.50. Again \$6.25+\$3.00+\$1.50=\$10.75−\$12.90 =\$2.15 error. Now (430×25)−(215×20) 10750 − 4300=6450 difference of products; 430−215=215 difference of errors; 6450÷215 =30lbs. of butter; $\frac{3}{5}$ of 30=18lbs. lard, and 30+18=48÷4=12doz. eggs; 30lbs. butter× 25=\$7.50; 18lbs. lard×20=\$3.60; and 12doz. eggs × 15 = \$1.80 + \$7.50+\$3.60 = \$12.90 proof.

(56)

$$\left.\begin{array}{lccc} \text{men} & \frac{218}{1} & : & \frac{24}{1} \\ \text{hours} & \frac{79}{5} & : & \frac{29}{2} \\ \text{long} & \frac{535}{4} & : & \frac{493}{4} \\ \text{high} & \frac{7}{2} & : & \frac{25}{4} \\ \text{wide} & \frac{43}{8} & : & \frac{39}{8} \end{array}\right\} :: \frac{1447}{8}$$

Inverted and cancelled :

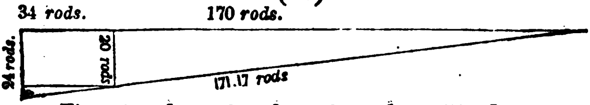
$$\frac{1}{218} \times \frac{5}{79} \times \frac{\cancel{4}}{\underset{107}{\cancel{535}}} \times \frac{\cancel{2}}{7} \times \frac{\cancel{8}}{43} \times \frac{\overset{3}{\cancel{24}}}{1} \times \frac{29}{\cancel{2}} \times \frac{493}{4} \times \frac{\overset{5}{\cancel{25}}}{\cancel{4}} \times \frac{39}{\cancel{8}} \times \frac{1447}{\cancel{8}}$$

Then $218 \times 97 \times 107 \times 7 \times 43 \times 4 = 2218675816$ divisor.

$1447 \times 39 \times 5 \times 493 \times 29 \times 3 \times 5 = 60511695075$ div'd.

$60511695075 \div 2218675816 = 27\frac{607448043}{2218675816}$da. *Ans.*

(57)



First 4 rods : 20 rods : : 34 rods : 170 *Ans.*
Then $170 \times 170 = 28900$, and $20 \times 20 = 400$;
Now $28900 + 400 = \sqrt[2]{29300} = 171.17+$ *Ans.*

(58) As the dog leaps as far at 2 leaps as the hare does in 3, the distance of the dog's leaps must be 1½ times farther than the hare's. Suppose the hare leaps 6 feet, then the dog must leap 9 feet; but the hare leaps 4 times to the dog's 3; the hare then in 4 leaps goes 24 feet, and the dog in 3 leaps goes 27 feet; consequently the dog in going 27 feet, gains 3 feet on the hare. Now say for the dog to gain 3 feet : he must go 27 feet : : then to gain 300 feet (equal to 50 of the hare's leaps) : he must go 2700 feet, which divided by 9 feet, the distance of the dog's leaps, gives 300 leaps *Ans.*

(59) Here as the son was to have twice as much as the mother, and the mother twice as much as the daughter, so we will suppose the estate to be divided as follows viz: $4+2+1=7$ the whole estate then as he left both a son and a daughter the mother must have but $\frac{2}{7}$ of the estate, whereas had he left only a daughter she would have had $\frac{2}{3}$; then $\frac{2}{3}-\frac{2}{7}=\frac{8}{21}=\$2400$ what the widow lost more than if he had left only a daughter; whence we have as $\frac{8}{21} : \frac{2400}{1} :: \frac{1}{3} : \$2100$ *Ans:*

(60) $60\times60=3600+3600=\sqrt[2]{7200.00}=84.85$ rods.

(61) $6.5\times6.5=42.25\times30=1267.50$ [+
$3.5\times3.5=12.25\times30=367.50$
$1267.50-367.50=900\times.7854=706.86$ft. *Ans:*

(62) First $\frac{2}{7}$ of £480 11s.=£137 6s. cost of the damaged goods; and £137 6s.—£49 6s.=£88 made out of the damaged goods. As 5s. 6d. : £88 : : 1yd. : 320yds. of damaged goods; as 2 : 5 : : 320 : 800yds. undamaged goods. Again £480 11s.—£88=£392 11s. value of the undamaged goods; then as 800yds. : 1E.E. : : £392 11s. : 12s. $3\frac{33}{160}$d. *Ans.*

(63) First $5-2=3$ hours the water was running before the tap was shut: then as 9min. : 3ho. : : 14gal. : 280gal. run in; as 31min. : 3ho. : : 40gal. : $232\frac{8}{31}$ gals. run out; $280-232\frac{8}{31}=47\frac{23}{31}$ gals. in when the tap was shut; $147-47\frac{23}{31}=99\frac{8}{31}$ gals. wants of being full. Again as 14 gals. : $99\frac{8}{31}$: : 9min. : 63min. $48\frac{228}{434}$ *Ans.*

(64) 20 knights÷4=5; 30 merchants÷5=6; 24 lawyers÷8=3; and 24 citizens÷12=2; then $5+6+3+2=16$

Then as 16 : 5 : : 64 : 20 paid by all the knights.
16 : 6 : : 64 : 24 do. do. merchants.
16 : 3 : : 64 : 12 do. do. lawyers.
16 : 2 : : 64 : 8 do. do. citizens.

(65) First suppose the principal \$4000 the interest of which will be \$240; and $\frac{1}{20}$ of \$4000= 200+100=300; this 300 should equal the interest but it gives an error of 60. Again suppose \$5000 principal, the interest is \$300, and by proceeding as before will give an error of 50; now (5000×60) – (4000×50) 300000– 200000=100000 the difference of the products. Again 60–50=10 difference of errors; 100000 ÷10=\$10000 *Ans.*

(66) After spending $\frac{5}{16}$ he had $\frac{11}{16}$ remaining, and spending $\frac{3}{4}$ of $\frac{5}{6}=\frac{5}{8}$ of the remainder, he had $\frac{3}{8}$ of that remainder left: therefore $\frac{3}{8}$ of $\frac{11}{16}=\frac{33}{128}$ of the whole left at last, the value of which is £537. then say as $\frac{33}{128}$: 1 : £537 : £2082 18s 2$\frac{2}{11}$d. *Ans.*

(67)

A. and B.=$\frac{3}{11}$=.2727
A. and C.=$\frac{5}{13}$=.3846
B. and C.=$\frac{2}{7}$=.2857

.9430

And .9430÷2 the number combined=.4715= A., B., and C.

.4715–.2857=.1858 A.
.4715–.3846=.869 B.
.4715–.2727=.1988 C.

As .4715 : .1858 : : \$35 : \$13.79+A.
.4715 : .869 : : \$35 : \$ 6.45+B.
.4715 : .1988 : : \$35 : \$14.75+C.

(68)

1 hour=3600 seconds.
10 miles=52800 feet.

As 3600 sec. : 45 sec. : : 52800 ft. : 660 ft. distance the hare had run before the dog discovered her.

Then 12 rods$=198$ft.$+660=858$ft. the distance of the hare when the dog started.

Again $16-10=6$ is what the dog gains on the hare every 16 rods the dog runs.

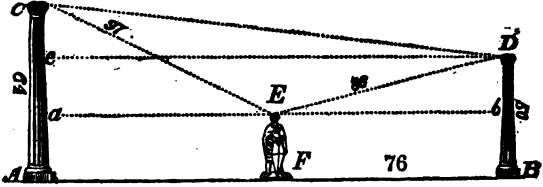
Then we have this proportion :

gain. to be gained. run. run.
As 6 : 858 : : 16 : 2288=the
distance in feet run by the dog.

16 miles=84480 feet.

ft. ft. sec. sec.
As 84480 : 2288 : : 3600 : 97½.

(69)



First $86\times86=7396={}^2E\,D$

And $76\times76=5776={}^2F\,B$ or $E\,b$

Then $7396-5776=1620={}^2D\,b$

And ${}^2\sqrt{1620}=40.24922=D\,b$

Also $50-40.24922=9.75078=E\,F$ height of statue.

Likewise $64-9.75078=54.24922=A\,C-Aa=aC$

Again $97\times97=9409\ {}^2E\,C$

And $54.24922\times54.29422=2942.97787={}^2a\,C$

$9409-2942.97787=6466.02213={}^2a\,E$ or ${}^2A\,F$

${}^2\sqrt{6466.02213}=80.41157=a\,E$ or $A\,F$

Now $76+80.41157=156.41157=A\,B$, or $c\,D$, distance of the columns.

And $64-50=14=cC$ difference of their heights

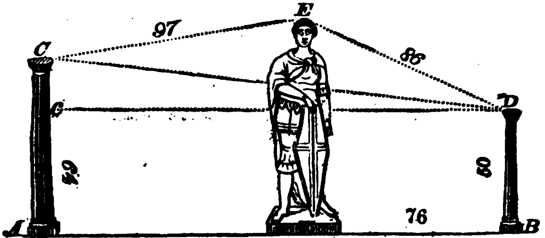
Now $156.41157\times156.41157=24464.5792={}^2C\,D$

And $14\times14=196={}^2Cc$

$24464.5792+196=24660.5792={}^2C\ D$

${}^2\sqrt{24660.5792}=157.03+$, distance of the top of the columns.

But if the statue be higher than the columns, then by working as before, we shall find the statue to be 40.24922 feet higher than the lower column.



Therefore $50+40.24922=90.24922=E\ F$ height of the statue.

Also $90.24922-64=26.24922$ higher than the highest column.

Then $97\times97=9409={}^2C\ E$

And $26.24922\times26.24922=689.02155$

diff. 8719.97845

${}^2\sqrt{8719.97845}=93.3808=A\ F$

So that $76+93.3808=169.3808=B\ F+F\ A$ distance of the column.

Again $169.3808\times169.3808=28689.8554064={}^2c\ D$

And $14\times14=196={}^2c\ C$

sum 28885.8554064

${}^2\sqrt{28885.8554064}=169.95839$ feet $=C\ D$ distance required.

(70) First $60\times60=3600$ the square of the whole diameter; $8\times8=64$ square of the diameter of the hole or useless part; then $3600-64$

$3536 \div 5 = 707.2$ square inches, each one grinds off; $3600 - 707.2 = \sqrt{2892.80} = 53.78 - 60 = 6.22 \div 2 = 3.11$ inches the first one grinds off. $2892.8 - 707.2 = \sqrt{2185.6} = 46.75 - 53.78 = 7.03 \div 2 = 3.51$ inches the second one grinds off. $2185.6 - 707.2 = \sqrt{1478.4} = 38.44 - 46.75 = 8.31 \div 2 = 4.15+$ inches the third one grinds off. $1478.4 - 707.2 = \sqrt{771.2} = 27.77 - 38.44 = 10.67 \div 2 = 5.33$ inches the fourth one grinds off. $771.2 - 707.2 = \sqrt{64} = 8 - 27.77 = 19.77 \div 2 = 9.88$ inches the fifth one grinds off.

(19)

CALCULATING SCHOOL-BILLS. (Arith. 215.)

(2) First $\$18 \times 4$mo.$= \$72$ teacher's board; then $\$72 - \$24.16 = \$47.84 + \$11.27$ wood and expenses$= \$59.11$; 215 days$+348+112+46+415+198 = 1334$ days in all; $\$59.11 \div 1334 = \$0.0443103$ for one day:

	Days.	$	wood.	$	per cent.	*Ans.*
A.	215	9.53		9.53	$0.47	$10.00
B.	348	15.42		15.42	.77	16.19
C.	112	4.96	4.50	.46	.02	.48
D.	46	2.04		2.04	.10	2.14
E.	415	18.39	2.25	16.14	.81	16.95
F.	198	8.77		8.77	.44	9.21

(3) First teacher's wages $\$75+$board $\$32.50+$wood $\$12.00+$expenses $\$2.50 = \$122 \div 2227$ whole number of days$= \$0.054782$ for one day for those who live out of the district; then G's. 75 days is $4.11 and H's. 281 days is $15.39 which added make $19.50. Again $\$75$ teacher's wages $- \$37.45$ public money$= \$37.55$: now $\$37.55 + \$32.50$ board$+ \$12.00$ wood$+$

expenses $2.50=$84.55−$19.50 G. and H pay=$65.05 to be paid by those who live in the district. Again from 2227 the whole number of days subtract 356 days sent by G. and H. leaves 1871 days sent by those who live in the district; now $65.05÷1871 days=$0.034767 for one day.

	days.	$	wood.	$	per cent.	*Ans.*
A.	624	21.70				
B.	423	14.71	$4.50	10.21	$0.51	$10.72
C.	158	5.49		5.49	.27	5.76
D.	95	3.30	3.00	.30	.02	.32
E.	250	8.69		8.69	.43	9.12
F.	321	11.16		11.16	.56	11.72
G.	75	4.11		4.11	.21	4.32
H.	281	15.39	4.50	10.89	.54	11.43

From $32.50, teacher's board, take $21.70, A's school-bill, leaves $10.80 due to A.

THE

FOLLOWING SCHOOL BOOKS

ARE PUBLISHED BY

WILLIAM WILSON.

A New and Improved Mental and Practical *ARITHMETIC,* by JACOB WILLETTS: 4th. Edition.

The ENGLISH READER, or Pieces in Prose and Poetry, selected from the best writers; sixteenth Edition, by RENSSELAER BENTLEY, A. M.

The ENGLISH SPELLING BOOK; containing the Rudiments of the English Language; an easy system of Spelling and Pronunciation; interspersed with Easy Reading Lessons; to which is added, a list of the Proper Names contained in the New Testament, calculated to teach the Orthography and Pronunciation of Walker: by RENSSELAER BENTLEY, A. M.

The ENGLISH SPELLING BOOK; Revised and Arranged, in accordance with the standard of NOAH WEBSTER, by the Rev. H. GALPIN: 4th Edition.